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By

AXEL H. OXHOLM
Trade Commissioner

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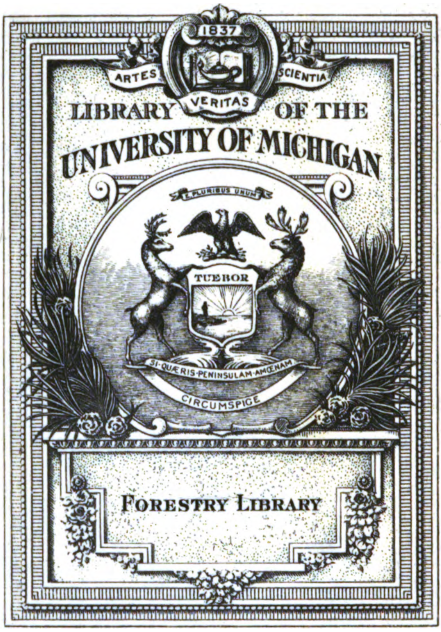

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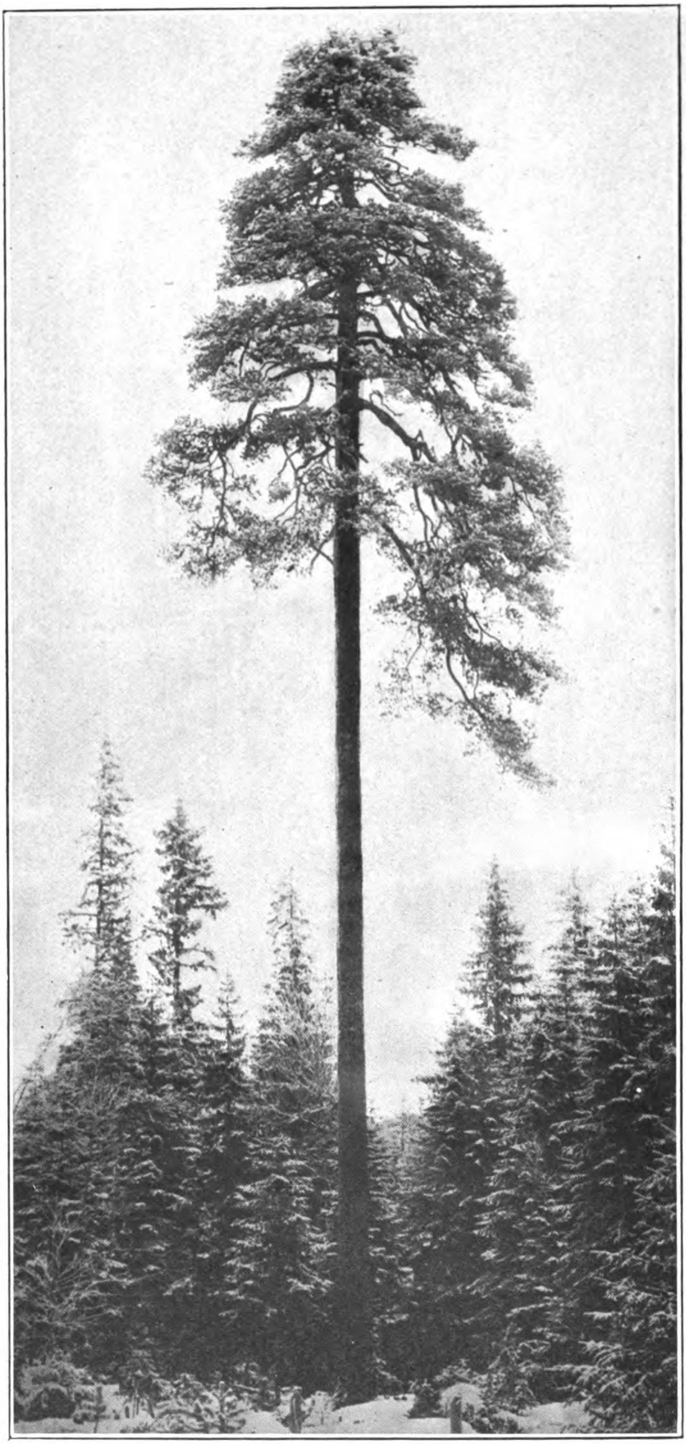

FIG. 1.—LARGEST PINE TREE IN FINLAND. DIAMETER AT BREAST HEIGHT, 28⅓ INCHES; HEIGHT, 98½ FEET.

U.S. DEPARTMENT OF COMMERCE

BUREAU OF FOREIGN AND DOMESTIC COMMERCE

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LETTER OF SUBMITTAL.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, April 4, 1921.

SIR: Submitted herewith is a report on the forest resources, lumber industry, and lumber export trade of Finland, by Axel H. Oxholm, a trade commissioner, who made a similar study of the lumber industry of Sweden that was published as Special Agents Series No. 195. The investigation in Finland was made during the latter part of 1917 and the early months of 1919. It was carried on under exceptionally trying circumstances in regard to food supplies and personal safety.

Finland has extensive forests and before the war was steadily growing in importance as a lumber-exporting country. The information presented in this report on the timber supply, character of output, and trade methods will no doubt be of interest to American lumbermen, and it is hoped that it will be of particular service in the marketing of their products.

Very respectfully,

C. E. HERRING, *Acting Director.*

To Hon. HERBERT HOOVER,
Secretary of Commerce.

FOREST RESOURCES, LUMBER INDUSTRY, AND LUMBER EXPORT TRADE OF FINLAND.

INTRODUCTION.

A study of the lumber industry of Finland offers a great deal of interest on account of the extensive timberlands in this country, a large percentage of which have not yet been exploited. Finland and Russia are probably the only two countries in Europe where any large areas of virgin forests are left. Furthermore, no other country in Europe has such a large percentage of its area covered with forests or such a large area of forests per capita as Finland.

The management of Finnish forests has been neglected in the past, and until recently no adequate laws have been established to regulate the cutting of timber. A new forest law came into effect during the war and this law, in connection with the recently established export duty on small timber, etc., will greatly reduce the reckless exploitation of immature stands that has taken place in past years.

The manufacturing methods in Finland are being rapidly improved, and during late years the smaller mills have, to a large extent, been bought by the larger companies, whereby the character of the lumber for export is made more uniform. One may, therefore, look to Finland as one of the world's principal suppliers of timber and lumber products. The lumber production in Finland has not yet reached its maximum and the country may be considered as one of the most promising lumber producers in Europe.

The labor situation has passed through a very critical stage, but with the return of normal conditions and an adequate supply of the necessities of life, it is believed that the Finnish labor question will be satisfactorily settled.

The activities of the Finnish Lumber Exporters' Association is of particular interest to American shippers, because cooperation of the Finnish lumber exporters has enabled them to sell their lumber to advantage, in spite of the fact that as much as 2,000,000,000 board-feet was stored in Finland when the armistice was signed. It is also of interest to note how the Finnish association has cooperated with the Swedish association of lumber exporters.

An important future problem for Finland is the shipping question. The present merchant marine of Finland is inadequate, but other countries have already opened new direct steamship lines to several of the most important markets for Finnish lumber, and it is believed that this circumstance will materially assist the Finnish exporters.

The future development of the lumber industry and export trade in Finland will no doubt require more effective utilization of the waste products, and the trend will be toward a decrease in the exportation of unmanufactured timber and an increase in manufactured products. It is safe to assume that in the future Finland will be able to export about 2,000,000,000 feet of lumber annually, but in order to find a market for this quantity it will be necessary for the Finnish lumber exporters to enter new fields, following in this respect the example of the Norwegian and Swedish exporters.

GENERAL DESCRIPTION OF THE COUNTRY.

Finland (Finnish, Suomi, "land of lakes") is situated in northern Europe immediately east of the Scandinavian Peninsula and extends from 60° to 70° north latitude and from 21° to 33° east longitude. The Gulf of Finland forms the southern boundary and the Bay of Bothnia is on the west. In the northwest the country borders Sweden, in the north Norway, and its entire eastern border faces Russia. Finland has its only ports in the south and west. The country does not extend to the Arctic Ocean and has no outlet that way.

The total area comprises 93,263,000 acres, of which 10,943,000 acres, or about 12 per cent, are inland waters. The area is therefore about the same as that of the State of Montana or the combined area of the States of Minnesota and Michigan. The extension from north to south is about 660 miles and from west to east about 370 miles.

Finland is politically divided into eight Provinces. The following table gives the area of the entire country and that of each Province:

Provinces.	Total area.	Inland water.	Per cent of water area.
	Acres.	*Acres.*	
Nyland	2,975,000	190,000	6.4
Abo and Bjorneborg	6,009,000	283,000	4.7
Tavastehus	5,171,000	862,000	16.7
Viborg	10,682,000	2,929,000	27.4
St. Michel	5,761,000	1,650,000	28.6
Kuopio	10,889,000	1,946,000	17.9
Wasa	10,270,000	755,000	7.4
Uleaborg	41,506,000	2,328,000	5.6
Total	93,263,000	10,943,000	11.7

The total land area, after deducting the area occupied by cities and towns, is 82,114,000 acres, which is classified as follows: Cultivated land, 4,641,000 acres, or 5.6 per cent; meadows, 2,371,000 acres, or 2.9 per cent; forests and unproductive land, 75,102,000 acres, or 91.5 per cent.

In this report the term "northern Finland" will be used to denote the area covered by the Province of Uleaborg and "southern Finland" the territory covered by the seven other Provinces.

TOPOGRAPHY.

Finland is a rather flat country and the only mountains are found the extreme north on the Norwegian border. These mountains attain a maximum height of about 4,000 feet. There are also some mountain ridges in the northeastern section of the country. South of these mountainous districts are plateaus of about 1,000 feet altitude above sea level. From the elevations in the north and northeast sections of Finland the country slopes down toward the Bay of Bothnia, the Baltic, and the Gulf of Finland. The coastal regions are very flat.

The other sections of Finland are characterized by low ridges and hills, seldom exceeding 300 to 600 feet in altitude. These ridges are usually covered with forests.

LAKES AND RIVERS.

Finland is called the "Land of a Thousand Lakes," and the whole country is penetrated by a network of rivers and inland water. It is estimated that there are more than 35,000 lakes in Finland, nearly all in the southern part of the country. These waterways are of great importance to the country, because they afford a good means of transportation and particularly facilitate the floating of logs. There are three principal water systems in central Finland: The Pyhajarvi-Kumo, the Paijanne-Kymmene, and the Saima-Vuoksen. Statistics of these systems follow.

System.	Land adjacent to system.	Area of water.	Per cent of water area.
	Acres.	*Acres.*	
Pyhajarvi-Kumo	7,290,000	1,112,000	13
Paijanne-Kymmene	7,215,000	1,853,000	20
Saima-Vuoksen	11,762,000	3,089,000	21

Ladoga Lake, in the southeastern part of the country, covers about 4,448,000 acres. It is divided between Russia and Finland, about 1,977,000 acres being in Finnish territory. In the extreme north lies the Lake Enare, covering about 346,000 acres, and in the central part Ulea Lake, covering about 247,000 acres. These lakes are the largest in the country.

Numerous rivers, up to 300 miles long, penetrate the country and connect the various lakes. There are seven rivers of special importance to the lumber industry. These rivers, enumerated from north to south, with the area of their drainage basins, are:

	Acres.
Tornea River (on the Swedish border)	3,459,000
Kemi River	13,097,000
Ijo River	2,471,000
Ulea River	5,683,000
Kumo River	8,649,000
Kymmene River	9,143,000
Vuoksen River	14,826,000

These seven rivers drain more than half of the total area of Finland, and all empty into the Bay of Bothnia, the Baltic, or the Gulf of Finland. The many small rivers flowing through the coastal districts along the Gulf of Finland and the Bay of Bothnia drain a very much smaller area. The coastal districts are only 30 to 90 miles wide, and their rivers drain 500 to 2,000 square miles each.

There are other rivers of less importance, some of which flow into Russian territory and empty into the White Sea, and also others that form part of river systems emptying into the Gulf of Finland on Russian territory.

A great many of the Finnish waterfalls have already been utilized for power and others will be developed in the near future. These waterfalls will play an important part in developing various industries. It has been estimated that the Finnish waterfalls can yield at least 3,000,000 horsepower when fully developed.

On account of the many rivers and lakes and the flat character of the country, there are vast areas of swamps, marshes, moors, and other unproductive lands. The extent of these areas is estimated from 6 to 25 per cent of the total area in the southern parts of Finland and from 35 to 40 per cent of the area in the northern sections.

CLIMATE.

Owing to the prevalence of west and southwest winds, the climate in Finland is less severe than it is on corresponding latitudes in other countries. The winter lasts very long, especially in the northern and eastern sections, and early frosts often destroy the crops. While the Scandinavian Peninsula to a great extent is benefited by the Gulf Stream, which makes the climate milder, Finland has more of an inland climate, and in the eastern sections it resembles that of interior Russia.

The average temperature in the different parts of the country is as follows:

	° F.		° F.
Latitude 60°	40.3	Latitude 66°	32.7
Latitude 61°	38.3	Latitude 67°	34.9
Latitude 62°	37.6	Latitude 68°	36.0
Latitude 63°	36.4	Latitude 69°	36.0
Latitude 64°	34.5	Latitude 70°	34.0
Latitude 65°	33.4		

The maximum temperature during the summer is 95° F. and the minimum temperature during the winter is 49° below zero.

From October until the middle of April frequent snowfalls occur and in the northern sections of the country the snow covers the ground during the latter part of September. The snow reaches its maximum depth in March, and at this time it is about 12 to 16 inches in the southwestern, 24 to 26 inches in the southeastern, and 30 to 32 inches in the eastern and northeastern sections.

During the winter all lakes and rivers freeze over and navigation is closed in the Bay of Bothnia, the Baltic, and the Gulf of Finland. This is an important factor to be considered in connection with the lumber export trade, because Finland is virtually cut off from shipping lumber for several months during the year. In November the northern shipping points are closed by ice, and as the winter progresses ice closes all the ports, except a few on the southwestern coast, which are kept open for traffic by ice breakers. These, however, have little or no importance as lumber export ports. During March and April the ice generally breaks up in the southern parts of the country, and the northern coast ports are generally opened to navigation during the latter part of May. Some years when the ice is exceptionally thick, or the season is late, the northern ports may be ice locked until June. The water of the Bay of Bothnia, the Baltic, and of the Gulf of Finland is brackish and freezes more easily than the salt water in the ocean.

POPULATION.

The population of Finland is approximately 3,250,000, scattered over an area which is larger than that of Italy and other countries in Europe having a population ten times as large as that of Finland. The density of population is about 26 per square mile. The majority of the population inhabits the southern part of Finland, particularly the coastal regions. In the northern and central regions the population is scattered.

The most important cities are Helsingfors, the capital, which has about 170,000 inhabitants, and is situated on the south coast; Abo, on the southwestern coast, with 54,000 inhabitants, is a port open the year round and the outlet for the traffic to Sweden during the wintertime; Tammerfors, with 45,000 inhabitants, located in the interior southern part of the country, is the most important industrial center in Finland; Viborg, near the southeastern border, has about 29,000, and Wasa, on the west coast, 27,000 inhabitants. The most important lumber export port is Kotka, which is near Helsingfors, on the southern coast, and has about 12,000 inhabitants. This is one of the principal lumber export ports in Europe.

Approximately 87 per cent of the population are Finns (Suomalaiset) and 13 per cent Swedes or Swedish descendants. The Finns belong to the Finno-Ugric race, which is closely related to some of the races in the Baltic Provinces. The general belief that the Finns belong to the Mongolian race seems to be disproved by recent investigations, which indicate that they belong to the Caucasian race. They have a language all their own, similar to the Magyar language in Hungary. Both the Finnish and Swedish languages are in official use. During the Russian régime Russian was also considered on par with Swedish and Finnish.

The Swedish-speaking people, although in the minority, have exercised a considerable influence on the customs, institutions, culture, and commerce of Finland. This part of the population is mainly in the cities in the coastal districts, while the rural population in the interior is largely made up of Finnish-speaking people.

On account of the difficult financial and political conditions in Finland in prewar days, emigration, particularly to the United States, has been large.

POLITICAL DEVELOPMENT.

Finland belonged to Sweden prior to 1809. In that year Sweden was forced, after war with Russia, to cede Finland to the latter country, and from that time until 1917 Finland was a part of the Russian Empire. However, the position of Finland was somewhat different from that, for instance, of Poland and other parts of Russia conquered by that country in wars. A certain amount of freedom was allowed Finland during the greater part of the last century and it was left to manage its own internal affairs. The country had a Russian governor, and the diplomatic and consular representation abroad was by Russian officials. Finland was not influenced to any great extent by Russian customs and methods until about 20 or 25 years ago. During the reign of the last Czar of Russia a change took place in this respect and considerable friction resulted from the efforts of the Russian Government to introduce Russian methods and institutions in Finland.

Finland took no active part in the war, as a previous arrangement with Russia exempted the Finlanders from maintaining an army. During the war the country was shut off from the world's market through the German blockade of the Baltic Sea and very serious conditions resulted, because Finland is largely dependent on foreign countries for its food supplies. With the downfall of the Russian Empire, the Finns availed themselves of the opportunity to make Finland an independent country, which was effected during the latter part of 1917. Serious internal trouble followed in the beginning of 1918, but the revolution was suppressed by the assistance of German troops, and as recompense for this assistance the Germans practically demanded the control of the whole of Finland in both a political and economical respect. The price was extremely heavy, but at the time it was a question of life or death and there was no choice in the matter. Fortunately for Finland, the Germans were defeated in the war, and it did not have to pay the price for the assistance received. The future of Finland depends upon internal peace. A strong organization of volunteers was established after the revolution to prevent any repetition of the experiences of 1918, and so far they have been able to maintain order.

ECONOMIC CONDITIONS.

The division of land in Finland is not so complete as, for instance, in Norway, where the land is divided among a great many small holders. There are many large estates in Finland and the wealth of the country is mainly in the hands of the holders of these estates and owners of industrial plants.

During the war nearly all the industries of Finland made a great deal of money, although the country was practically cut off from the exportation of its products to other markets than Russia. During the early part of the war the Russian Government placed in Finland large orders for war materials, involving millions of feet of lumber, paper, pulp, and other forest products. The export of firewood from Finland to Russia was heavy during the war and the prices were high. As the imports of the country were largely curtailed, the money earned could not be spent abroad, and at one time during 1917 the banks were so flooded with money that only very small or no interest at all was paid on deposits. All values ran up to fantastic heights and particularly the price of timberland, because it was considered a safe investment.

While the Finnish Government lost large sums of money in unfortunate dealings with Russia and otherwise had large expenditures during and after the war, the factory owners, persons engaged in commerce, farmers, and landowners accumulated riches.

Among the principal assets of the country are the enormous stocks of lumber and timber and other wood products manufactured and stored during the war. It was estimated at the time the armistice was signed that at least 2,500,000,000 feet of lumber, valued at approximately 850,000,000 to 900,000,000 Finnish marks ($164,000,000 to $174,000,000 par value), were stored in Finland.

On the other hand, the laboring class and the salaried people are in a very unsatisfactory position. Food was very scarce during the war and in many sections of the country the people ate bread partly made of the bark of trees, moss, cabbage leaves, etc.

The following statement gives the cost of some of the principal articles of food in an average sawmill district of southern Finland in 1913:

		Cents.			Cents.
Milk	per quart	4¼	Meat (beef)	per pound	23
Butter	per pound	31	Fresh pork	do	15½
Potatoes	per bushel	56	Salt herring	do	6¼
Peas	per pound	3½	Coffee	do	32
Rye flour	do	1¾	Sugar	do	11½

During 1916 the increases were as follows:

	Per cent.		Per cent.
Milk	20	Beef	71
Butter	14	Fresh pork	100
Potatoes	15	Salt herring	166
Peas	66	Coffee	158
Rye flour	115	Sugar	55

During 1917 the situation became aggravated and the prices went up to fantastical heights, but did not reach their climax until the latter part of 1918, when famine prices were ruling. There are no reliable quotations for this time, as the sale of foodstuffs was to a large extent in the hands of profiteers and speculators, the rations allotted by the Government being insufficient. Rye flour was frequently sold for 15 to 20 marks ($2.90 to $3.85 at par value of the mark) per pound, sugar 50 to 60 marks ($9.65 to $11.58) per pound, and other foodstuffs in comparison.

The cost of living decreased to some extent during the latter part of 1919, but is still high on account of the decreased value of the mark, which affects the price of all foodstuffs that have to be imported.

It is only natural that these unsatisfactory food conditions, which have existed for a considerable time, must set back the whole nation in every respect. Many people starved to death in Finland during the war. The class distinction between the moneyed class and the wage-earning class is now greater than ever before.

Among one of the most serious economic problems is the decline in the rate of exchange for Finnish marks. While the par value of the Finnish mark is $0.193, its value decreased materially during the war and at the present time remains low. The principal reason for this is the large importation of food and other necessities of life, which must be paid for in foreign exchange, and the limited exportation from Finland up to the present time. It is expected, however, that the rate of exchange will improve when the exports of the large stocks of lumber, pulp, paper, and other articles increase.

The Finnish Government will likely find itself in a difficult financial position unless sufficient money can be raised through taxation, customs duties, etc., to defray the expenditures incurred for administration, army and navy, etc. These items are very much larger now than ever before and the Government's revenues are small on account of the restricted importation and consequent small returns from customs duties. The expenditures of the Government in 1919 were about seven times as large as in 1915.

TRANSPORTATION.

Transportation facilities in Finland are good. The country possesses about 2,485 miles of railroad, 90 per cent of which is Government owned. The railroads do not play such an important part in the lumber industry in Finland as is the case in other countries. Several of the large rivers have been made navigable by a system of sluiced canals, and there are other canals connecting one river system with another. Canals connect some of the large interior lakes with the Baltic, so that steamers can go up the rivers and lakes for hundreds of miles into the interior. The most important is the Saima Canal. The amount of freight hauled through the Finnish canals was 1,700,000,000 tons in 1914 and 2,500,000,000 tons in 1913, which is about one-half the amount of the freight hauled by the railroads during those years. These canals offer important facilities for the transportation of sawlogs and lumber.

The mercantile marine consisted of 478,000 register tons in 1914, of which 393,000 tons were sailing vessels and 85,000 tons steamers. During the war a large percentage of these ships were lost. A great many vessels, however, operate only on the inland lakes and can not be considered as seagoing vessels.

There is need for better transportation facilities for northern Finland, in order to exploit the large timber areas in that part of the country. The main difficulty is that Finland has no port on the Arctic Ocean. Such a port would be of the utmost importance to the country and would give the lumber industry in the northern parts of the country a great impetus, as lumber could be shipped from such ports the year around.

A railway is now contemplated between the port of Petschenga, on the Arctic Ocean, and Rovaniemi, which is the present terminus of the northernmost railroad in Finland. Such a railroad would pass through some of the most important forest regions of northern Finland and would give the owners of these forests an opportunity to better exploit their holdings. It is reported that this railroad is to be built partly with foreign capital. It will also be of great service in the development of the iron mines in northern Finland, which are said to be as important as the mines at the same latitude in Sweden.

INDUSTRIES.

Agriculture is the main industry of Finland and gives employment to the largest number of people. The crops of 1914 were valued at about $61,000,000. Cattle raising and dairying are also important occupations and considerable quantities of butter and hides are exported during normal times. Finland has shown a tendency in recent years to change from a grain-producing to a cattle-producing country. The industries have also grown rapidly. On account of these changes the country is now more dependent upon imports of grains and other food supplies than before, and this circumstance proved very disastrous during the war.

The following statement shows the value[1] of the productions of the principal industries in the country according to the industrial statistics of 1913:

Lumber industry	$33,042,000
Foodstuffs	24,566,000
Cellulose and paper industry	19,562,000
Textile industry	18,171,000
Iron and steel industry (shipbuilding, etc.)	9,962,000
Smelting of ores, metals, etc	6,192,000
Leather industry	5,898,000
Stone, glass, pottery, etc	5,471,000

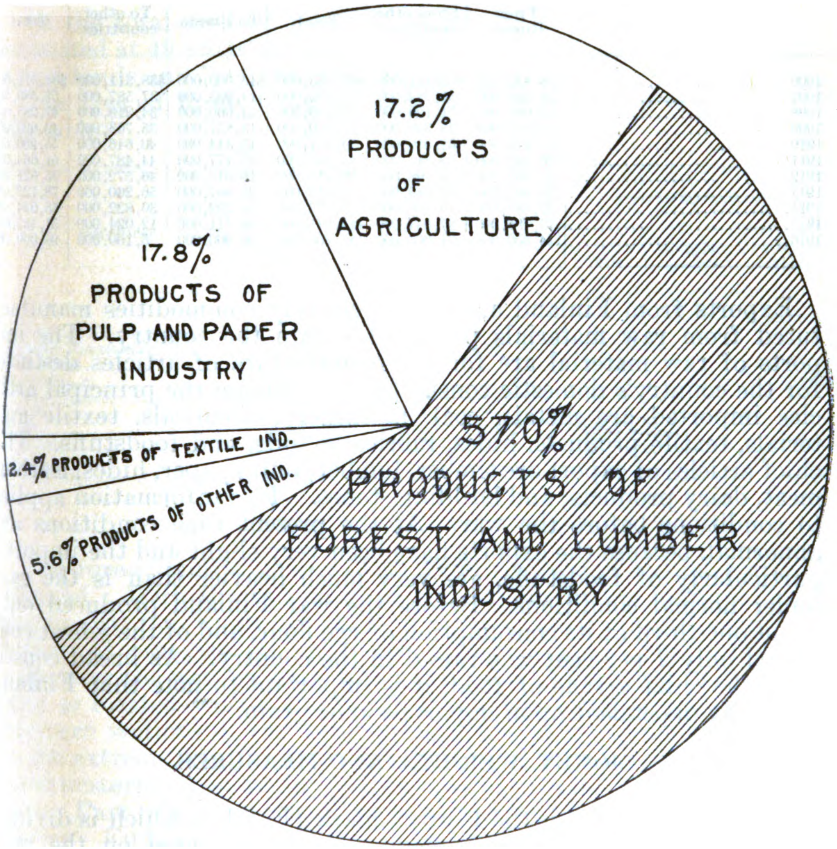

FIG. 2.—Exports from Finland in 1913.

Fishing is one of the important activities of Finland. The industrial districts are mainly found in southern Finland, especially in the coastal regions.

COMMERCE.

Finland is not so favorably located for foreign trade as, for instance, Norway. Besides being closed by ice during several months of the year, Finland is somewhat distant from the main centers of commerce in Europe. The foreign trade has mainly been with Russia, and the latter country will always be one of the principal markets for Finnish products and also the principal source of supplies of raw materials.

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[1] Throughout this report values given in United States currency have been converted from Finnish marks at the par rate of $0.193 per mark. During 1917 and 1918 the exchange value of the mark was about $0.15. In 1919 this value declined sharply.

The following table gives the figures for exports and imports for the years 1906 to 1916, inclusive:

Years.	Imports.			Exports.		
	From Russia.	From other countries.	Total.	To Russia.	To other countries.	Total.
1906	$18,432,000	$42,151,000	$60,583,000	$16,000,000	$38,311,000	$54,311,000
1907	21,384,000	51,782,000	73,166,000	13,993,000	37,587,000	51,580,000
1908	19,030,000	51,126,000	70,156,000	13,066,000	34,219,000	47,285,000
1909	22,542,000	48,308,000	70,850,000	13,857,000	35,763,000	49,620,000
1910	21,172,000	52,959,000	74,131,000	15,344,000	40,646,000	55,990,000
1911	26,441,000	59,348,000	85,789,000	17,177,000	44,487,000	61,664,000
1912	25,302,000	65,408,000	90,710,000	19,049,000	46,572,000	65,621,000
1913	26,924,000	68,689,000	95,613,000	21,867,000	56,260,000	78,127,000
1914	27,889,000	45,490,000	73,379,000	24,222,000	30,822,000	55,044,000
1915	73,784,000	37,847,000	111,631,000	39,411,000	12,024,000	51,435,000
1916	114,800,000	71,000,000	185,800,000	90,900,000	5,100,000	96,000,000

Exports from Finland are almost entirely commodities manufactured from raw materials produced within the country. The imports of raw material are for the manufacture of articles destined for the country's domestic consumption. Among the principal articles imported are metals, coal, machinery, chemicals, textile materials, textile products, hides, lubricants, oils, and foodstuffs. The chief articles of export are timber, lumber, pulp, paper, hides, leather, meat, dairy products, and building stones. This information applies to conditions before the war. At the present time conditions are abnormal, because the exports have been very slight and the imports, particularly of foodstuffs, are very much heavier than is the case under normal conditions. Before the war Finland produced only about one-third of its consumption of rye flour, and of the wheat consumed only 2 per cent was raised in the country. As bread constitutes the chief article of food, it is important to note that Finland is largely dependent upon importation of grain.

MONEY, WEIGHTS, AND MEASURES.

The monetary unit is the Finnish mark (F. mk.), which is divided into 100 penni (pi.). The monetary system is based on the gold standard, and the par value of the Finnish mark is $0.19295. There are 5.18262 marks to the dollar. The monetary system is thus the same as the French franc system.

The standard of weights and measures is in accordance with the metric system, but in the lumber export trade the English standards of measure are used, although the figures in the official statistics are expressed in the metric units.

THE FORESTS.

GENERAL DESCRIPTION.

Of the total area of Finland, 93,263,000 acres, the forest area is estimated at 49,820,000 acres, of which 41,833,000 acres are productive forest lands and 7,987,000 acres inferior forest lands.

The area of forest lands in each Province is shown in the following table:

Provinces.	Productive forest land.[a]			Inferior forest land.		
	Total.	State forests.	Private forests.	Total.	State forests.	Private forests.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Nyland	1,610,000	314,000	6,745,000	48,000	410,000	3,693,000
Abo and Bjorneborg	2,859,000			142,000		
Tavastehus	2,590,000			230,000		
St. Michel	2,221,000	64,000	2,157,000	563,000		
Viborg	4,220,000	331,000	3,889,000	987,000		
Kuopio	4,233,000	617,000	3,616,000	1,383,000		
Wasa	3,880,000	507,000	3,373,000	750,000		
Uleaborg	20,352,000	11,336,000	8,884,000	3,884,000	2,330,000	1,554,000
Total	41,833,000	13,169,000	28,664,000	7,987,000	2,740,000	5,247,000

[a] Based on Forest Commission's statistics.

The forest lands thus constitute 53.56 per cent of the total area of Finland. With the exception of the regions in the extreme north, practically the whole country is covered with forests, consisting mainly of pine, spruce, and birch. There are, however, certain regions near the western coast that are barren. The larger part of Finland is located within the north Baltic coniferous region. In the northern sections of the country birch forests are predominant, and in the extreme southwestern parts some oak forests are found. This southwestern forest region belongs to the central European oak region. Part of southern Finland is within the south Baltic coniferous region. Finland has very few national resources besides forests.

It was not until the middle of the last century that the great value of the forests was realized. At this time the sawmill industry started on a large scale and the foundation for the lumber, pulp, and paper export trade was laid. Since that time the forests have increased in value each year. Prior to the middle of the last century practically the only wood products exported were sawlogs, wood tar, and firewood. At one time the forests were promiscuously cut down or burned over in order to clear land for agricultural purposes, and even up until recent years it was a practice in the eastern sections to burn over large areas of forest lands and use the ashes as a fertilizer for the raising of grain.

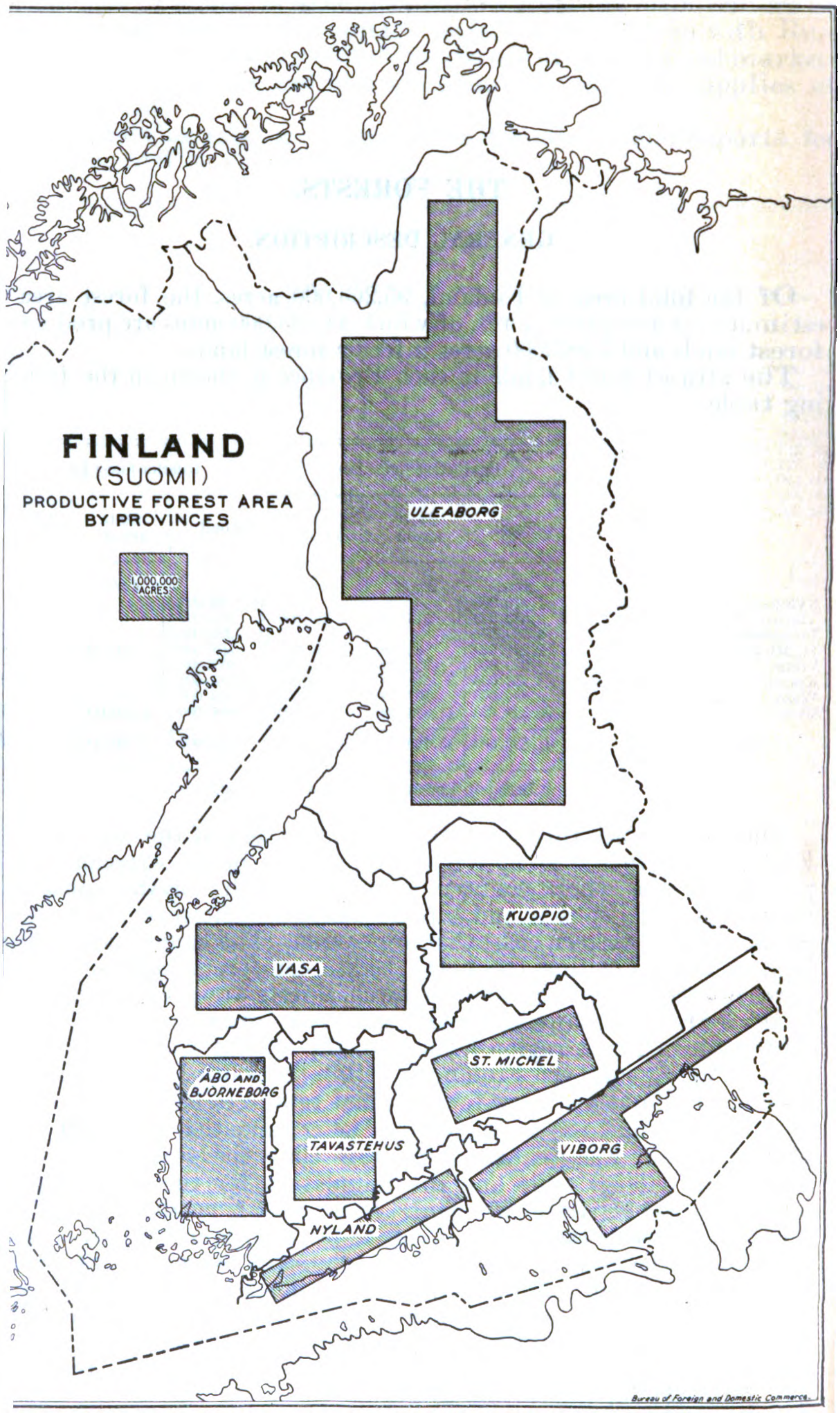

FIG. 3.—Productive forest area by Provinces.

Systematic exploitation of the Finnish forests did not take place until about 1860. This date may be considered as a turning point in the economic history of the country, because the forests to-day are the principal assets of the nation. The great importance of the forests is shown by the fact that the export of lumber, timber, pulp, paper, and other wood products amounted to $58,000,000 in 1913, or approximately 74 per cent of the value of the total exports of Finland.

Rational forest management in a modern sense of the word has not generally been practiced in Finland until recently. Particularly the forests owned by private individuals show evidence of a lack of rational management, and the most valuable timber in these forests has often been badly cut out.

With the exception of coastal districts and certain sections in the interior, the rest of the country is probably better adapted for growing forests than for agriculture. The vast areas of marshes, swamps, and bogs, now almost denuded of forests, offer great possibilities in the future for draining and reforestation. The conditions of growth in the southern part of Finland is, in fact, better than usually found in the neighboring countries. Nearly all Finnish forests show signs of having once been burned over, and on these burned-over lands birch forests have frequently replaced the coniferous species.

OWNERSHIP.

Statistical information regarding the private forests in Finland is very meager. The following table gives an estimate of the division of forest lands in Finland according to ownership:

	Acres.
State	16,042,000
Cities and counties (communes)	452,000
Lumber and pulp companies	6,919,000
Private individuals	26,539,000
Total	49,952,000

Since this estimate was made the Government has purchased (in 1918) approximately 1,483,000 acres of some of the best timber land in southern Finland. This land was formerly in the hands of lumber companies. Furthermore, private individuals have acquired about 124,000 acres. The forests in private ownership are mainly in the hands of farmers, landowners, and other individuals, and their timber supply has been very severly drained in years past. These forests are, therefore, usually in a very poor state.

The private forests in the hands of individuals, especially in the Bay of Bothnia coastal districts, have been badly damaged by the practice of "boxing," which is stripping the timber of bark in order to produce wood tar. The tar industry, however, has greatly declined in the last few decades. While in 1860 two districts alone on the Bay of Bothnia exported 24,000 barrels of tar per year, for which product about 70,000,000 cubic feet of pine would be required, the total export of tar from the entire country was only 18,000 barrels in 1913.

In contrast to these areas the forest lands in the hands of lumber companies, pulp companies, and other wood-using industries are usually very well taken care of. The largest companies have, as a rule, trained foresters to look after their property, and the cutting is usually done along scientific lines. These forests have been managed with the intention of safeguarding the supply of raw material for all time to come, and in order to attain this end considerable money is spent by these companies for reforestation, improvement of the stands, draining, etc. There is no question but that these companies are in a better position to exploit the forests in a rational way than the small individual holders, because the large companies can better afford to manage the forests efficiently.

The best forests in Finland are those in the hands of lumber and pulp companies, and the majority of privately owned forests are found in southern Finland. There are several companies each holding from 700,000 to 1,000,000 acres of forest lands. Although it undoubtedly is an advantage from an economic point of view to have sawmill and pulp companies own the forests necessary to secure an adequate supply of raw material for their mills, it is a matter of great concern what effect this has on the agricultural development of the country. Most of the timber holdings were acquired decades ago, many of them at a very low price. In purchasing these lands the companies frequently included farms and other properties of a similar nature. The companies were not, as a rule, interested in farming and either abandoned the farms or rented them to tenants. From being independent farmers a large part of the rural population has become wage earners in the industrial centers or tenants on the land they formerly owned. These conditions largely contributed to the unfortunate social unrest which culminated during the war when the revolution broke out. There has, therefore, been a strong movement to prevent the companies from making additional purchases of forest lands.

In 1915 a law was passed restricting the purchase by wood-using companies of such forest lands as are suitable for agricultural purposes (farm land, pastures, etc.). Forest lands not particularly suitable for these purposes may be purchased unrestricted. This law, however, is often evaded by the formation of supposedly independent companies for the purpose of following agricultural pursuits. Such companies may purchase forest lands, and the sawmill companies then contract for the logging of timber on these lands.

Since the revolution a great many land and forest owners have facilitated the acquiring of land by their tenants, and it is believed that this step will have an important effect upon the stabilizing of the social conditions in Finland.

The forests owned by cities and counties are well managed and cut with due regard to the principles of forestry. The cutting is very conservative and effected according to detailed plans made in advance of each season.

In many sections the forests have been badly damaged through excess cutting or lack of proper forest practices. This mismanagement, however, does not apply to the forests in the hands of large lumber and pulp companies, the State forests, and the forests belonging to towns, cities, and communes.

Since the last important Government purchases, in 1918, of forest lands, part of which were in foreign ownership, the area of forests ed by foreigners is insignificant.

SPECIES.

Generally speaking, the same species of wood are found in Finland as in Scandinavia. The coniferous trees are predominant, and probably 75 per cent of the forests are pine and spruce and about 25 per cent broad-leafed species.

PINE.

Only one variety of pine (*Pinus sylvestris*) is found, but the quality of the timber is different in the north and the south. Pine grows practically all over the country, except in the extreme north. It occurs in clear stands or mixed with spruce and also with birch and other hardwoods. The best stands of pine are found on dry, sandy soil. Such soil is found in the central parts of southern Finland, in the neighborhood of the Jyvaskyla district, and in the regions east and northeast of this section. In this part of the country the pine tree develops into its most perfect form and may be found in heights up to 100 or 125 feet. The stands are dense and the bole shows a larger freedom from knots than in the coastal and mountainous districts, where the growth is smaller and the trees have a great many limbs. The pine does not grow very well on boggy lands and the stands found on these areas are defective in regard to quality. Such land is found in the southeastern part of the country. The texture of the pine in these sections is very spongy and the color is almost white. The percentage of heart is small and the timber is knotty. Lumber cut from such timber is very likely to discolor if improperly seasoned.

In the northern parts of the country the trees stand farther apart and the limbs grow almost down to the ground. The color of the wood is reddish or yellowish red, and the percentage of heart is much larger than in the south. The timber cut in northern Finland frequently shows frost shakes, and this is a serious defect. The height of the trees is generally smaller in the north, but the texture of the wood is solid and dense on account of the slow growth. Such timber often shows as much as 40 to 45 rings per inch, while 10 to 12 rings would be about normal in central Finland. In the southeastern part 5 to 7 rings per inch would probably be the average.

The taper of the trees varies a great deal. In the interior it may be about $1\frac{3}{16}$ inches in 10 feet, while in the north and in the coastal regions the taper is very much greater. On account of the root system pine trees are better able to survive forest fires than spruce.

The quality of Finnish pine is generally considered in the world's markets as somewhat inferior to Swedish and Norwegian pine, but this is to a large extent a matter of prejudice, because Finnish lumber has frequently been defectively manufactured and seasoned in the past. The wood may be more knotty, but there is otherwise no important difference between the qualities of Finnish and Scandinavian pine. As substantiating this assertion it may be mentioned that large quantities of Finnish timber are taken across the Bay of Bothnia to Swedish mills, manufactured into lumber, and sold as Swedish products.

SPRUCE.

Botanically speaking, there are two varieties of spruce, *Picea excelsa* and *Picea obovata*, but the difference is merely a botanical one, and no distinction is made in the lumber trade, and both kinds are used for the same purposes.

Spruce does not occur so generally all over the country as pine. Clear stands of spruce are found in the southeastern parts, where the tree attains its best form, particularly on the Isthmus of Karelia, which is a narrow stretch of land between Lake Ladoga and the Gulf of Finland. Other clear stands of spruce are found in the western parts of the Province of Nyland, in the coastal districts of Wasa, and in the northern coastal districts of the country. The quality of the stands in the north is not as good as in the south. The spruce from the southern part of the country, particularly from the Province of Viborg, is noted for its good quality. The color of the wood is white and the texture very solid.

While pine prefers dry, sandy soil, spruce grows excellently on calcareous soil and prefers moisture. Spruce is generally more knotty than pine, but the knots are small and firmly encased in the wood and being of a light color are not as conspicuous as pine knots, which are brown. Spruce is liable to decay, and a great many overmatured stands are found in northern Finland showing this defect.

Very little research work has been done to determine the properties of Finnish wood, such as breaking strength, etc., but as the pine and spruce closely resemble the Swedish species, it is believed that the results of tests of the Swedish wood may be adopted for the Finnish pine and spruce.[1]

BIRCH.

There are two species of birch, *Betula verrucosa* and *Betula odorata*, but no distinction is made in the lumber trade between these two kinds and both are used for the same purposes. Birch is used locally as a general utility wood. In the export trade it has its greatest importance as material for the veneer and bobbin industries, which have been greatly developed during recent years.

Birch is found all over the country and particularly in the extreme north, where it passes over into a scrubby growth in the higher altitudes. On burned-over lands birch will often replace pine and spruce. Extensive birch forests are also found in sections of the country where the natural reproduction of pine and spruce is difficult.

The best birch forests are found in the interior districts in central Finland (Jyvaskyla region). The trees may in the most favorable cases attain a diameter of 9 to 10 inches at breast height at the age of 55 to 60 years. The principal defect is the large number of knots, which is a serious drawback when the birch is used for making veneer. As the export of birch lumber is practically negligible, birch will not be extensively treated in this report.

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[1] See "Swedish Forests, Lumber Industry, and Lumber Export Trade," Special Agents Series No. 195, Bureau of Foreign and Domestic Commerce. Sold by the Superintendent of Documents, Government Printing Office, at 75 cents.

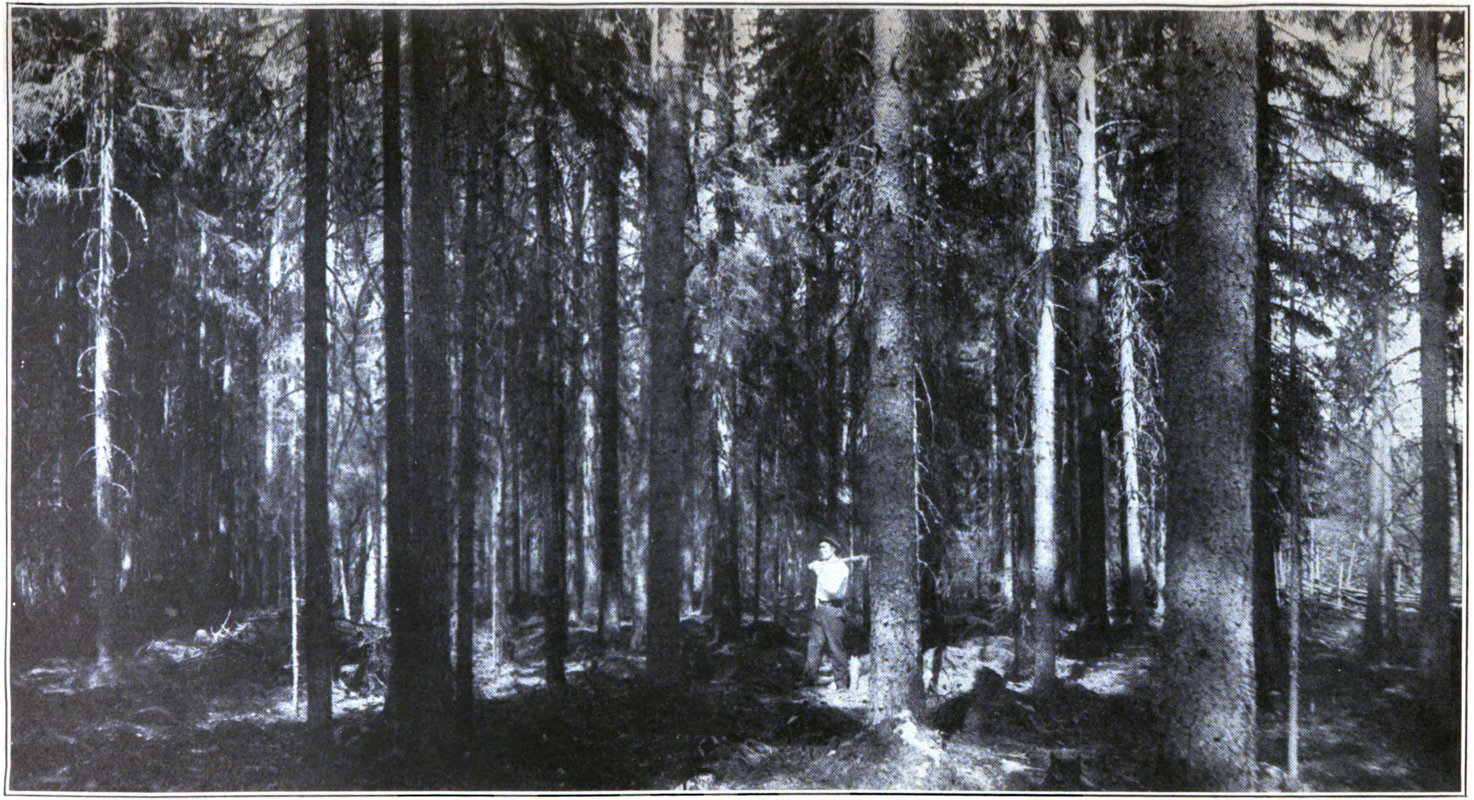

FIG. 4.—MIXED STAND OF SPRUCE AND PINE, EVOIS STATE FOREST.

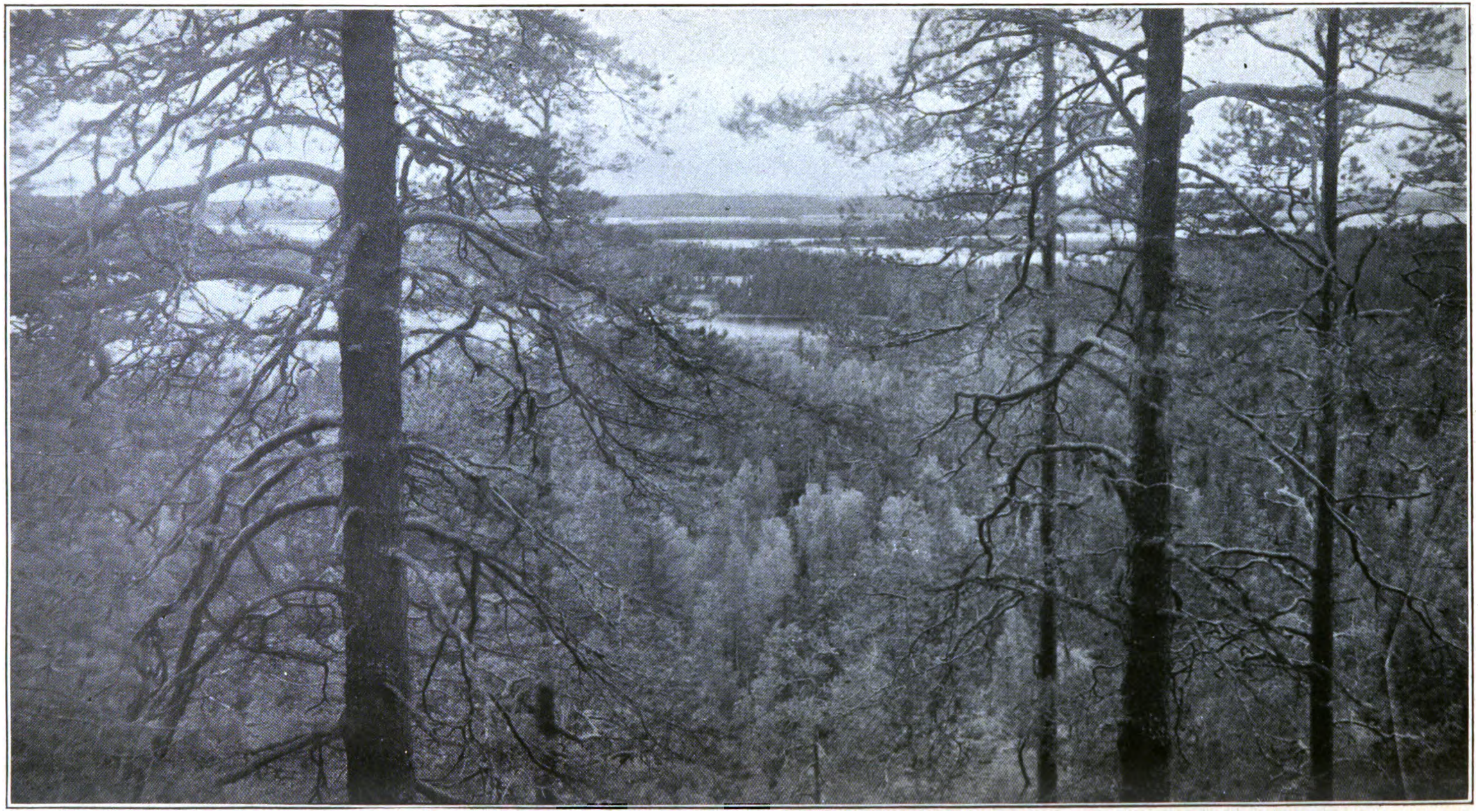

FIG. 5.—TYPICAL GROWTH OF FINNISH PINE.

OAK.

Finnish oak (*Quercus pedunculata*) is found in coastal regions in the southwestern parts of the country. The stands are very small and inadequate to supply the needs of the country. The quality is also unsatisfactory and can not in any way compare with the quality of oak found in other parts of Europe.

Finnish oak can only be used for wagon stock, shipbuilding, and for rough construction work in general, and is not well suited for furniture and interior finish. It may therefore be left out of consideration, because it is not an article of export.

Of other hardwoods may be mentioned aspen (*Populus tremula*), used for match making and for veneer, alder (*Alnus incana*), basswood (*Tilia europaea*), maple (*Acer platanoides*), ash (*Fraxinus excelsior*), elm (*Ulmus montana*), and a few other species, used mainly for furniture, implements, etc. The supply of these species of hardwood is limited, the stands are scattered, and their importance is therefore small. The annual cut is entirely consumed by the local markets. Furthermore, the quality is not comparable with foreign species, mainly on account of the many knots and the small dimensions obtained.

Very few foreign species of wood are planted in Finland. The only important species is larch (*Larix sibirica*), which is planted on limited areas in southeastern Finland.

STAND PER ACRE AND GROWTH.

The data available on the stand per acre and annual growth are very meager. An investigation recently made by an expert, covering the Provinces of Viborg, St. Michel, and Kuopio, showed that the average stand per acre of productive forest land was about 1,187 cubic feet, and on boggy forest land 872 cubic feet. The average stand on all forest lands in these Provinces was about 1,073 cubic feet per acre, and the annual increment was estimated at 28.6 cubic feet per acre. An investigation of the forest lands owned by one of the largest lumber companies in southern Finland revealed the fact that the average stand per acre was 715 cubic feet for the total forest area. In rare cases would the stands average more than 4,290 cubic feet per acre. The annual increment covering the whole area was about 25.7 cubic feet per acre. It was pointed out, however, that in a few cases the annual increment per acre had been raised to 43 cubic feet on land that had been under rational forest management for some time. The average stand on the better class of forest land in southern Finland is about 1,073 cubic feet per acre, and the annual increment about 32 cubic feet. In northern Finland the stand per acre is, on an average, 572 to 715 cubic feet.

Another recent investigation on this point gives the following estimate regarding the forests in central Finland belonging to industrial establishments, such as pulp mills, lumber mills, and others. These forests have been divided into three categories: No. 1, very good timber holdings having an average stand of 2,345 cubic feet per acre; No. 2, forests having an average stand of 1,658 cubic feet per acre;

and No. 3, inferior forest lands. It was found that 20 per cent of all these forests belonged to category No. 1, 50 to 55 per cent to category No. 2, and the remaining 25 to 30 per cent to category No. 3.

It was also brought out in this investigation that the forests of category No. 1 showed a stand per acre 50 per cent larger than was found in the forests belonging to farmers and other individual forest owners in the same districts, and forests of category No. 2 showed an increase of 49 per cent. The stand per acre in the forests belonging to lumber and pulp companies was estimated at about 20 per cent below the maximum stand which these forests could have supported if managed more scientifically, and the forests belonging to farmers and individual forest owners showed a stand per acre 40 per cent below that which they might have shown under better management. The annual increment on these productive forest areas belonging to lumber and pulp companies varied from 24 to 31 cubic feet per acre.

The following table (compiled by Prof. A. G. Blomqvist) shows the average stand, annual increment, and number of trees per acre of select pine forest land in different sections of Finland:

Age of stand.	Southern Finland (latitude 59° 48′ to 61° 30′).			Central Finland (latitude 61° 30′ to 64°).			Northern Finland (latitude 64° to 68°).		
	Stand per acre.	Annual increment per acre.	Trees per acre.	Stand per acre.	Annual increment per acre.	Trees per acre.	Stand per acre.	Annual increment per acre.	Trees per acre.
	Cubic feet.	*Cubic feet.*		*Cubic feet.*	*Cubic feet.*		*Cubic feet.*	*Cubic feet.*	
10 years	300	30.0	6,475	300	30.0	6,475	129	12.9	6,475
20 years	729	42.9	2,023	644	34.3	2,380	315	18.6	2,582
30 years	1,372	64.4	1,639	1,058	41.5	1,934	600	28.6	2,185
40 years	2,092	72.9	1,263	1,516	45.8	1,538	972	37.2	1,829
50 years	2,903	80.0	951	2,017	51.5	1,174	1,501	42.9	1,530
60 years	3,618	71.5	761	2,603	57.2	955	1,788	38.6	1,263
70 years	4,247	62.9	647	3,232	62.9	776	2,116	32.9	1,036
80 years	4,819	57.2	567	3,775	54.3	642	2,388	30.0	834
90 years	5,363	54.3	502	4,233	45.8	558	2,660	27.2	656
100 years	5,849	48.6	441	4,719	48.6	486	2,874	21.5	591
110 years	6,335	48.6	364	5,077	35.8	429	3,075	20.0	510
120 years	6,778	44.3	344	5,420	34.3	372	3,246	17.2	437
130 years	7,107	32.9	300	5,749	32.9	319	3,389	14.3	380
140 years	7,322	30.5	263	6,020	26.2	283	3,518	12.9	340
150 years	7,650	22.9	235	6,249	22.9	251	3,618	10.0	300
160 years	7,850	20.0	214	6,378	11.9	227	3,704	8.6	275
170 years	7,950	10.0	202	6,449	7.2	219	3,790	8.6	251
180 years	8,008	5.7	194	6,449	.0	202	3,847	5.7	235
190 years	7,979	−2.8	186	6,420	−2.8	194	3,861	1.4	227
200 years	7,922	−5.7	178	6,364	−5.7	186	3,861	.0	219

In southern Finland pine and spruce forests are considered mature for cutting at about 75 to 80 years of age, in the most favorable cases. In the central parts of the country the age for cutting is about 100 or 120 years, in the southern parts of the Province of Uleaborg 120 to 150 years, and in the extreme north 200 to 250 years. By systematic forest management, the pulp companies expect to reduce the age of maturity for cutting to about 60 to 65 years, but such trees would not be suitable for sawlogs.

The following table (by Forest Engineer A. Sivén) shows the time required to produce pine and spruce trees of specified diameters (measured 23 feet from the ground) in different parts of Finland:

Latitude.	Pine.			Spruce.		
	5 58/64 inches.	7 56/64 inches.	9 54/64 inches.	5 58/64 inches.	7 56/64 inches.	9 54/64 inches.
	Years.	*Years.*	*Years.*	*Years.*	*Years.*	*Years.*
60°-61°	62	82	111			
60°-62°				79	96	116
61°-62°	67	89	121			
62°-63°	78	105	142			
63°-64°	78	99	129			
64°-65°	76	101	145			
65°-66°	98	131	175			
66°-67°	112	154	208			
67°-68°	106	157	209			
62°-65°				98	123	153
65°-67°				128	162	202

The time required for a tree to grow to a height of 23 feet is as follows:

Section.	Pine.	Spruce.
	Years.	*Years.*
Southern Finland, latitude 60°-62°	28-31	46
Central Finland, latitude 62°-65°	36-41	56
Northern Finland, latitude 65°-68°	48	63

The following table gives an estimate for the whole country:

Age of stand.	Average height.		Diameter at 23 feet from ground.	
	Pine.	Spruce.	Pine.	Spruce.
	Feet.	*Feet.*	*Inches.*	*Inches.*
50 years	43	37	3	2¼
60 years	50	46	4	3½
70 years	56	53	5	4⅛
80 years	60	59	6	5½
90 years	66	64	6¾	6¼
100 years	69	63	7½	7
110 years	73	72	8¼	7⅞
120 years	75¾	75	8⅞	8½
130 years	78	77½	9½	9
140 years	79	78¾	10	9¾
150 years	82	82	10⅞	10½

In the Enare Lake district, in northern Finland, the average height of the pine tree is 13 feet at 40 years of age, 19½ feet at 56 years, and 30 feet at 200 years.

FOREST MANAGEMENT.

There are very few virgin forests left in Finland on privately owned land. The majority of the virgin forests are in northern Finland and are generally State forests. Timber from this section is often overmature, showing numerous defects, such as shakes, rot, and large loose knots. From an economical standpoint it would be advantageous to the country to have these virgin forests cleaned out, because better growing conditions would be given to the younger growth and the quality of the timber would be improved.

For the establishment of a system of rational forestry on an economical basis, the first condition would be a market for the young timber necessarily cut in order to improve the stand. In many parts of Finland, particularly in the interior sections of the north, where the floating of timber is unsatisfactory and expensive, there is no such market at present, and it is therefore difficult to carry out a plan of scientific forest management. In other parts of Finland, especially in the coastal regions and in locations near the railroad and inland waterways, the facilities for the marketing of such small timber are excellent. One would therefore expect to find the best managed forests in these districts. This, however, is not the case. For instance, in practically the whole of the Saima and Ladoga districts, in the southeastern part of the country, the forests have been poorly managed and the annual yield of timber has been severely reduced during the last decades. The stand of timber per acre in many of these districts to-day is not even one-third of what could be produced if the forests were properly managed.

Careless cutting in the past and a disregard of reforestation are responsible for these conditions, and in large areas only a worthless scrubby growth is seen. The same conditions also apply to many of the coastal districts on the Bay of Bothnia, where the "boxing" of timber and a reckless cutting of small saplings for mine props have taken place for a number of years. The cut-over areas, however, may be reforested, because the logged-over lands in Finland show remarkable facilities for the growing of new forests, even in cases that would seem almost hopeless in many other countries.

REFORESTATION.

Until very recently there have been practically no laws in Finland limiting the cutting of private forests or any compulsory reforestation of cut-over lands. Reforestation has been practiced only by a few of the very largest pulp and lumber companies on their holdings and by the Government in the State forests.

The new law, which went into effect January 1, 1918, makes provision for the reforestation of cut-over lands. It is estimated that about 220,000 acres of private forests in Finland need to be reforested every year. Most of this area can be reforested by natural reproduction by leaving mother trees, but it is estimated that at least 62,000 acres should be artificially reforested by planting or seeding. Prior to 1918 only 10 per cent of this area was artificially reforested, so that reforestation was by no means generally practiced by private forest owners.

STATE FORESTS.

The total area in State ownership is given at 31,009,000 acres (1914). This area is divided as follows: Cultivated fields, 172,000 acres, or 0.56 per cent; productive forest land, 13,169,000 acres, or 42.47 per cent; swamps, marshes, unproductive land, sparsely forested, 16,526,000 acres, or 53.29 per cent; inland water, 1,142,000 acres, or 3.68 per cent.

The productive forest area is thus less than half of the Government-owned land, and constitutes about 31.4 per cent of the total area of productive forests in Finland. The Government-owned forest

lands consist either of land set aside by the Government for forestry only, or lands containing forests but open to cultivation and farming.

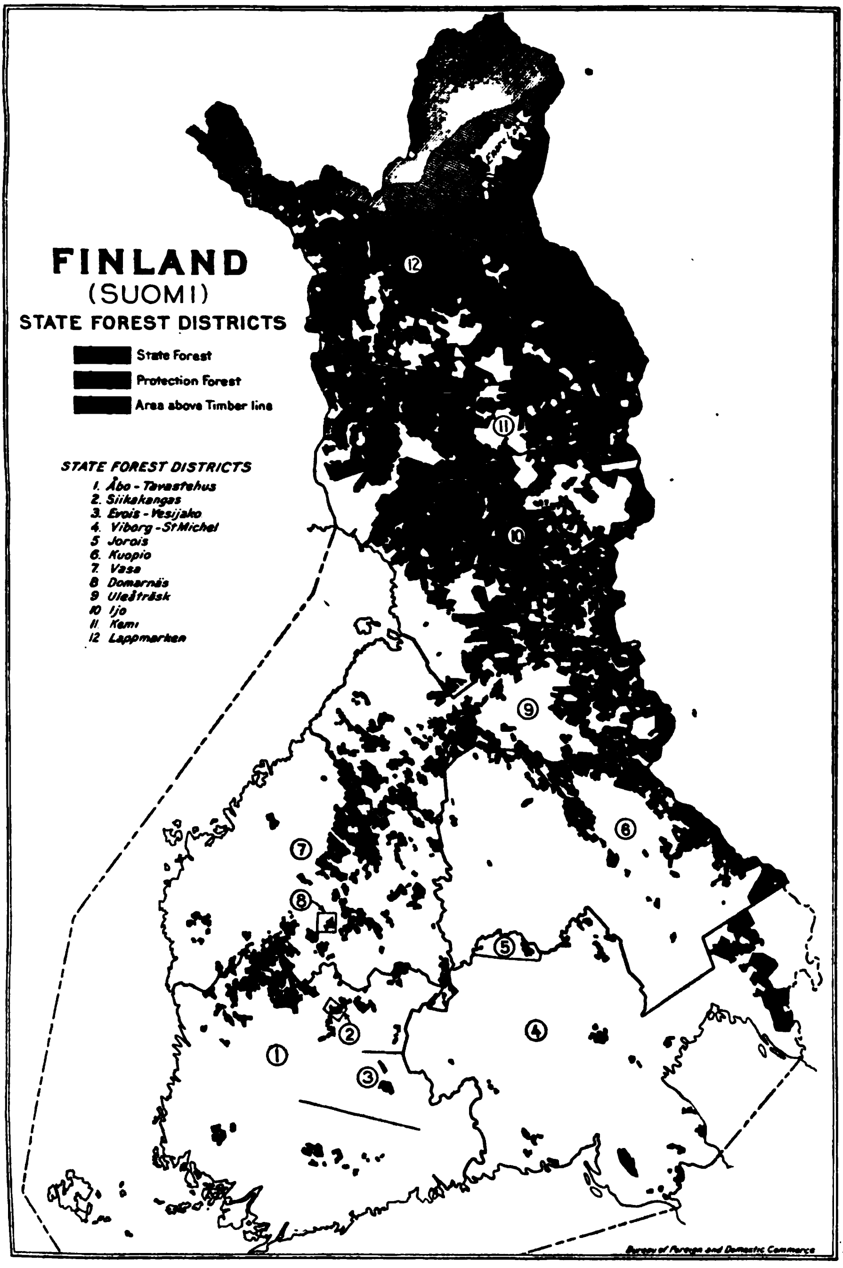

FIG. 6.—State forest districts of Finland.

A large percentage of the best State forest areas are lands connected with church and military institutions, etc., but the Government manages these properties and they may, therefore, be considered as State forests.

About four-fifths of the total area of the productive State forests is in northern Finland. The State forests in southern Finland are scattered, while the State forests of northern Finland are in one almost unbroken area, with only a few scattered private timber holdings.

The State forests are divided into various districts and the area and productive forest lands of these districts, according to Forest Service statistics, are as follows:

Districts.	Productive forests.	Total area.	Districts.	Productive forests.	Total area
	Acres.	*Acres.*		*Acres.*	*Acres.*
Abo-Tavastehus	293,000	546,000	Domainas	2,000	5,000
Siikakangas	5,000	10,000	Uleatrask	1,903,000	3,428,000
Evois-Vesijako	15,000	21,000	Ijo	2,103,000	4,283,000
Viborg-St. Michel	373,000	649,000	Kemi	3,138,000	5,744,000
Jorois	15,000	17,000	Lappmarken	4,255,000	12,763,000
Kuopio	588,000	1,249,000			
Wasa	479,000	979,000	Total	13,169,000	29,694,000

A conservative estimate gives the value of the State forests in Finland as about $350,000,000 to $400,000,000, but no reliable figures are available.

MANAGEMENT OF STATE FORESTS.

The State forests are managed by the Forest Service (Forststyrelsen), which is located in the capital, Helsingfors. At the head of the Forest Service is a general director, assisted by two forest counselors, three forest engineers, one chief auditor, three chief foresters, one chief surveyor, and a staff of experts in different lines. The State forests are divided into several districts, and for each district there is a district forester, who supervises the State forests in his district.

The Forest Service is also expected to work for the improvement of forest management in private forests, but the lack of appropriations has not enabled it to carry out as much work along these lines as has been needed. Increased activities of this nature are planned for the future. The new forest law of 1917 will bring the Government and the private forest owners into closer contact, and the Government will endeavor, in the future, to spread more knowledge among private forest owners regarding forest management.

PURCHASE OF TIMBER LANDS.

During recent years the Government has followed the policy of acquiring additional forest lands. The following expenditures have been made for this purpose during recent years:

1906	$17,000	1911	$16,000
1907	34,000	1912	9,000
1908	51,000	1913	84,000
1909	59,000	1914	48,000
1910	9,000		

In 1918 the Government took a very important step in purchasing the majority of stock in the largest lumber and pulp company in

Finland. This company had timber holdings of more than 1,200,000 acres in the best districts in Finland. During the same year another important purchase was made of a pulp and sawmill concern with extensive timber holdings in southeastern Finland.

STANDS OF TIMBER.

The State forests have, until recently, been cut in a very conservative way and consequently there are large areas of virgin timber left, particularly in northern Finland, because these regions are less accessible than other parts of the country and have been less exploited. The timber from the State forests is of larger dimensions than that from private forests, but is frequently defective, because a large percentage of the stands is overmature.

The approximate percentage of coniferous and broad-leafed trees in the State forests is given in the following table:

Districts.	Coniferous species.	Broad-leafed species.
	Per cent.	*Per cent.*
Abo-Tavastehus	85- 93	7-15
Wiborg-St. Michel	85- 87	13-15
Uleatrask	87- 90	10-13
Kuopio	94-100	6
Ijo	55- 88	12-45
Kemi	80- 96	4-20

The percentage of State-forest area to total area in the different Provinces is as follows: Nylands, 0.22 per cent; Abo and Bjorneborg, 6.57 per cent; Tavastehus, 5.08 per cent; Viborg, 7.1 per cent; St. Michel, 1.73 per cent; Kuopio, 12.12 per cent; Wasa, 9.97 per cent; Uleaborg, 75.9 per cent.

An investigation of the age stands of the coniferous species in State forests was recently made. In the districts of Abo-Tavastehus, Viborg, and Kuopio, and in central Finland, and around the Bay of Bothnia the coniferous forests required about 120 years to reach the age of maturity for cutting, and showed the following results in respect to the age of the stands: 1 to 40 years, 12.94 per cent; 41 to 80 years, 34.63 per cent; 81 to 120 years, 52.43 per cent.

These figures indicate that the forests contain an abnormally high percentage of mature trees, and that the percentage of young growth is very small. The mature trees in these forests should have been cut to a greater extent in order to give better growing conditions for the young trees. They have not been cut on account of transportation difficulties and the low prices for the logs.

In the districts of Lapland, Kemi, and Ijo, in the northern section of Finland, the high percentage of overmatured stands is also striking. The percentage of coniferous trees by age groups, based on the total stands of coniferous and broad-leafed trees, is as follows: 1 to 50 years, 5.87 per cent; 51 to 100 years, 14.3 per cent; 101 to 150 years, 21.23 per cent; 151 to 200 years, 24.7 per cent; 200 years and over, 20.13 per cent. The remaining 13.77 per cent consists of broad-leafed trees.

In the Uleatrask district these conditions do not apply. An investigation in this district shows the following results for coniferous trees: 1 to 50 years, 32.5 per cent; 51 to 100 years, 42.9 per cent; 101 to 150 years, 11 per cent; 151 to 200 years, 5.1 per cent; 201 years and over, 2.4 per cent. The remaining 6.1 per cent is represented by broad-leafed trees.

The average stand, in cubic feet per acre, on productive land in the State forests is as follows:

	Cubic feet per acre.
Abo-Tavastehus district	829–1,544
Viborg-St. Michel district	1,358–2,002
Kuopio district	1,344–1,888
Uleatrask district	468–887
Ijo district	543–815
Kemi district	858

The quantity of standing timber has been estimated in the following way: The mature trees in the State forests have been divided into two categories: Category No. 1 being trees having a diameter at breast height of 9¾ to and including 11½ inches, and category No. 2 trees measuring 11¾ inches and over. The number of trees of each category in the different districts is as follows:

Districts.	Trees per acre.			Total number of trees.		
	Category No. 1.	Category No. 2.	Categories Nos. 1 and 2.	Category No. 1.	Category No. 2.	Categories Nos. 1 and 2.
Abo-Tavastehus	11	9	20	3,567,000	2,616,000	6,183,000
Siikakangas	15	8	23	88,000	47,000	135,000
Evois-Vesijako	20	5	25	320,000	78,000	398,000
Viborg-St. Michel	16	12	28	6,239,000	4,197,000	10,436,000
Jorois	8	3	11	107,000	42,000	149,000
Kuopio	16	10	26	9,862,000	6,352,000	16,214,000
Wasa	10	6	16	4,697,000	2,973,000	7,670,000
Domarnas	17	9	26	53,000	28,000	81,000
Uleatrask	7	4	11	13,051,000	7,170,000	20,221,000
Ijo	6	3	9	13,376,000	7,038,000	20,414,000
Kemi	5	5	10	17,707,000	16,481,000	34,188,000
Lappmarken	5	4	9	20,975,000	15,395,000	36,370,000

The statistics for 1914 do not give any further data in regard to the timber stands in the State forests. The following figures give an estimate of the total quantity of standing timber in the different districts:

	Cubic feet.
Lappmarken district	2,420,000,000
Kemi district	2,983,000,000
Ijo district	2,068,000,000
Uleatrask district	1,577,000,000
Osterbotten district	889,000,000
Central Finland district	529,000,000
Kuopio district	1,289,000,000
Viborg-St. Michel district	787,000,000
Abo-Tavastehus district	382,000,000
Domarnas, Siikakangas, Evois-Vesijako, and Jorois districts	79,000,000
Total	13,003,000,000

ANNUAL CUT.

The total cut in the State forests in 1914 amounted to 86,879,000 cubic feet, or about 6.58 cubic feet per acre of productive forest land.[1] This quantity represents sawlogs, construction timber, firewood, props, etc. The corresponding figures for the three preceding years were as follows: 1911, 86,168,000 cubic feet; 1912, 86,157,000 cubic feet; 1913, 84,175,000 cubic feet.

The following statement shows the total cut per acre, based on productive forest land only, in 1914:

	Cubic feet.
Abo-Tavastehus district	30.89
Siikakangas district	38.32
Evois-Vesijako district	113.83
Viborg-St. Michel district	24.31
Jorois district	4.58
Kuopio district	13.73
Wasa district	15.30
Domarnas district	133.13
Uleatrask district	6.44
Ijo district	5.29
Kemi district	4.43
Rovaniemi district	21.59
Lappmarken district	3.00
Average	6.58

The cut of mature trees suitable for sawlogs, construction timber, masts, and similar products in the State forests in 1914 was as follows:

	Cubic feet.
Abo-Tavastehus district	2,587,000
Siikakangas district	10,000
Evois-Vesijako district	238,000
Viborg-St. Michel district	4,154,000
Jorois district	1,000
Kuopio district	4,804,000
Wasa district	3,144,000
Domarnas district	182,000
Uleatrask district	6,530,000
Ijo district	8,560,000
Kemi district	11,328,000
Rovaniemi district	16,000
Lappmarken district	11,750,000
Total	53,304,000

The corresponding figures for the three preceding years were as follows: 1913, 51,220,000 cubic feet; 1912, 56,149,000 cubic feet; 1911, 58,877,000 cubic feet.

The following statement gives the value of the timber cut in State forests: In 1911, $2,335,000; in 1912, $2,432,000; in 1913, $2,509,000; in 1914, $2,799,000.

SELLING OF GOVERNMENT TIMBER.

The Government usually sells the trees standing. During late years, however, it has cut limited quantities of sawlogs for sale.

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[1] This quantity was cut on both productive and unproductive forest lands, but no distinction is made in the statistics to show the quantities cut on each kind of land. The cut per acre, if based on productive and unproductive forest lands combined, would amount to less than one-half of the figures given.

A detailed specification of the trees for sale in each district is given to the public and contracts are awarded at public auction, generally held in August. Large quantities are also sold at local auction sales during other times of the year. In some cases special contracts are made for the sale of Government timber outside these auction sales.

Some years before the war a British syndicate obtained a concession of about 3,600,000 trees in the northernmost part in Finland. The Government gave this concession on very easy terms, extending the contract to cover a period of 16 years. The concession expired a short time ago without anything having been done by the British company to exploit these forests on a large scale. The main difficulty was to put the River Paatsjoki in condition for floating, as this would require a large amount of money, and the war interferred with the company's plans. It is believed that other concessions will be given by the Government when normal conditions are restored.

Another company with limited capital, partly Finnish and partly Russian, obtained a concession during the war near the same region where the British syndicate operated, but it is believed that this company acquired the concession with the intention of selling it to other parties for exploitation.

The northern forest regions are very sparsely populated, and food, provisions, and material must be brought hundreds of miles by horses, as there are no railroads in this part of the country. The climatic conditions are extremely severe, and the ice on Lake Enare sometimes does not melt until June.

As the number of mills in proportion to the forest area is very much smaller in Finland than in Sweden and Norway, the competition for sawlogs is naturally not so keen as in those countries. In certain districts the demand for Government timber has been very small, either because of unsatisfactory log-transportation facilities, or, in some cases, on account of combinations among the mills bidding for this timber. At any rate, for a number of years the Government has been confronted with the problem of having a large percentage of the trees unsold on account of lack of bids or the offer of unsatisfactory prices. The following table shows the percentage of unsold mature trees in proportion to the total number of mature trees offered for sale:

Districts.	1909	1910	1911	1912	1913	1914
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Abo-Tavastehus	2.9	10.8	24.5	....	....	2.3
Viborg-St. Michel	21.9	6.6	12.5	4.5	3.1	34.2
Jorois	41.9	....	....	....	....	....
Kuopio	29.1	7.5	43.9	42.6	23.5	57.0
Wasa	29.6	31.1	24.6	35.6	3.2	65.6
Uleatrask	23.1	10.8	19.6	21.3	40.9	47.7
Ijo	11.5	50.0	44.9	20.0	16.2	36.9
Kemi	14.5	10.8	28.3	37.5	23.5	73.5
Lappmarken	70.8	48.5	17.2	16.4	35.4	81.5
Average, all districts	36.7	21.9	29.1	25.6	22.9	55.6

The number of mature trees from State forests offered for sale from 1898 to 1914 was as follows:

1898	817,000	1907	2,393,000
1899	1,306,000	1908	2,874,000
1900	934,000	1909	3,395,000
1901	1,306,000	1910	2,728,000
1902	1,569,000	1911	2,486,000
1903	997,000	1912	2,465,000
1904	1,360,000	1913	2,753,000
1905	1,868,000	1914	2,658,000
1906	2,205,000		

While the pulp, paper, and lumber industries are mainly located in the southern parts of Finland, the Government-owned forests are largely in northern Finland. With the growth of the lumber industry in northern Finland the importance of the Government-owned timber holdings will increase.

The following table shows the percentage of sawlogs from the State forests used by the lumber mills in proportion to their total log supply:

	Per cent.		Per cent.
1900	8	1911	26
1905	10	1912	26
1907	16	1913	20
1910	23	1914	25

The following statement gives the average price per tree (standing) obtained at the public auction sales for timber suitable for sawlogs and construction timber:

1900	$1.00	1908	$0.69
1901	.89	1909	.68
1902	.83	1910	.74
1903	1.12	1911	.81
1904	.81	1912	.83
1905	.97	1913	.83
1906	1.04	1914	.64
1907	.92		

For the years 1915, 1916, 1917, and 1918 the following detailed statement shows the number of trees sold and the prices paid in each district:

Districts.	1915				1916			
	Trees sold.	Price per tree.	Average contents per tree.	Price per cubic foot.	Trees sold.	Price per tree.	Average contents per tree.	Price per cubic foot.
			Cubic feet.				*Cubic feet.*	
Lappmarken	219,294	$0.69	12.95	$0.05	132,464	$1.05	13.47	$0.08
Kemi	205,446	.67	14.14	.05	74,670	.68	13.35	.05
Ijo	222,905	.61	12.60	.05	169,624	.94	15.70	.06
Uleatrask	201,955	.51	13.40	.04	81,434	.65	12.50	.05
Osterbotten	117,834	.65	11.07	.06	72,800	1.56	12.80	.12
Central Finland	127,279	1.51	14.40	.10	81,564	2.59	14.85	.18
Abo-Tavastehus	50,408	1.62	14.85	.11	51,588	2.16	16.30	.13
Viborg-St. Michel	204,010	1.17	16.67	.07	56,974	2.30	18.20	.12
Kuopio	208,410	.93	12.95	.07	211,751	2.02	13.80	.15

Districts.	1917				1918			
	Trees sold.	Price per tree.	Average contents per tree.	Price per cubic foot.	Trees sold.	Price per tree.	Average contents per tree.	Price per cubic foot.
			Cubic feet.				*Cubic feet.*	
Lappmarken	47,182	$0.94	13.60	$0.07	144,205	$1.23	13.60	$0.09
Kemi	214,097	1.01	14.15	.07	293,389	1.61	15.49	.10
Ijo	100,447	1.24	14.82	.08	239,363	1.35	14.78	.09
Uleatrask	82,411	1.04	15.33	.07	81,022	1.03	12.17	.08
Osterbotten	56,710	1.11	12.23	.09	50,661	1.23	11.77	.10
Central Finland	56,750	1.45	12.39	.12	118,745	2.20	14.00	.16
Abo-Tavastehus	25,473	1.53	14.36	.11	62,381	2.37	15.56	.15
Viborg-St. Michel	42,346	2.18	17.29	.13	10,464	3.06	17.56	.17
Kuopio	24,449	1.25	13.49	.09	....	....	....	....

REFORESTATION ON FOREST LANDS.

The Government has reforested considerable areas of barren land in the State forests. In 1914, 3,351 acres were reforested, in 1913, 2,473 acres, and in 1912, 2,684 acres.

The areas of forest lands drained by the Government have been as follows: 1912, 7,067 acres; 1913, 1,614 acres; 1914, 746 acres. During the war the exorbitant cost of labor greatly hampered this work.

The cost per acre of forest culture in the Finnish State forests has been given as follows:

Seeding:	
Clearing of land and harrowing	$3.13
Seeding	.39
Cost of seeds	3.51
Total	7.03
Planting:	
Clearing of land	6.26
Planting	3.13
Transportation of plants to field	3.90
Cost of plants	5.86
Total	19.15

The above figures refer to the war period, when the cost of labor was approximately 10 marks ($1.93 at par value) per day. Before the war the cost of labor was less than half of this amount and the cost of planting and seeding correspondingly lower. At the present time the cost of labor is at least 100 per cent higher than the above estimate.

FOREST FIRES IN STATE FORESTS.

The damage caused by fire in Finnish forests is comparatively small. The area burned over in the State forests during recent years and the estimated damage were as follows: In 1911, 3,000 acres, damage, $11,000; 1912, 6,000 acres, damage, $12,000; 1913, 5,000 acres, damage, $21,000; 1914, 23,000 acres, damage $87,000.

Forest fires were formerly more serious, but at the present time the increased number of forest wardens and forest rangers all over the

State forests keep constant watch for fires during the dry season. The area destroyed by fire in the State forests during 1883, 1886, and 1894 was as follows: 1883, 134,000 acres; 1886, 159,000 acres; 1894, 167.000 acres. It is not believed that any such fires will occur in the future, because the forests have a greater value and more attention is paid to their protection.

GOVERNMENT-OWNED SAWMILLS.

Before the war the Government operated several sawmills, selling part of their products in Finland and exporting the balance. During the war the Government acquired other sawmills and pulp mills. The largest of the sawmills, which is located at Kotka, has a normal production of about 150,000,000 board feet of sawn and planed lumber, most of which is exported. The company is the Aktiebolaget W. Gutzeit & Co. Another mill, the Aktiebolaget Tornator, is located on the Saima Canal and has a production of about 5,000,000 board feet of sawn lumber. The Government holds the majority of the stock in these companies, but they are operated in the same way as before the purchase was made, and the Government does not take any active part in the management. The following smaller mills are owned and operated by the Government. All are located in the State forests.

1. The Siuro Sawmill, using about 150,000 logs a year. Most of these logs are manufactured into stock for the railroads in Finland and about 2,000,000 board feet are exported annually.
2. The Kevatniemi Sawmill, sawing annually about 160,000 logs, which are manufactured into lumber of which about 1,000,000 board feet are for export.
3. The Sukeva Sawmill, sawing about 170,000 logs. This mill cuts lumber for the local demand only.

These mills were established in order to exploit more effectively the Government forests and to supply the Government's needs for lumber and lumber products. The output of these three mills is of very small importance in the lumber export trade.

INCOME FROM THE STATE FORESTS.

Until about 40 years ago the State forests did not show any net profit. Before that time the operations in them had been conducted with heavy losses, due partly to unsatisfactory conditions for the selling of logs.

The following statement shows the annual net profit and loss from the State forests from 1861 to 1916, inclusive. A minus sign indicates loss.

1861	—$51,000
1862	— 17,000
1863	12,000
1864	— 22,000
1865	— 47,000
1866	— 42,000
1867	— 53,000
1868	— 66,000
1869	— 50,000
1870	— 43,000
1871	— 25,000
1872	$29,900
1873	70,000
1874	297,000
1875	210,000
1876	— 18,000
1877	— 9,000
1878	57,000
1879	— 40,000
1880	60,000
1881	62,000
1882	130,000

1883	$65,000	1900	$760,000
1884	35,000	1901	508,000
1885	105,000	1902	519,000
1886	103,000	1903	973,000
1887	163,000	1904	905,000
1888	220,000	1905	587,000
1889	201,000	1906	1,000,000
1890	266,000	1907	1,488,000
1891	102,000	1908	1,220,000
1892	305,000	1909	1,062,000
1893	336,000	1910	1,612,000
1894	286,000	1911	1,677,000
1895	345,000	1912	1,693,000
1896	208,000	1913	1,930,000
1897	264,000	1914	1,928,000
1898	332,000	1915	1,034,000
1899	407,000	1916	1,401,000

It is probable that the revenue from the State forests will increase steadily in the future, particularly after improvements have been made in log-transportation facilities in northern Finland, which will open up forest areas that have been almost inaccessible heretofore.

FINNISH FOREST LAWS.

It is important to consider the laws regulating and restricting cutting of timber in Finland, because these restrictions will materially affect the nation's future output of timber. A short summary is therefore given of the law effective from January 1, 1918, bearing on the management of the forests, and the laws passed prior to 1918.

Several centuries ago, during the Swedish régime, Finland had certain laws concerning the management of private forests. In 1664 laws were passed restricting the practice of burning over forest lands for agricultural purposes, and in 1734 other laws went into effect stipulating that forest owners must not cut their forests in such a way as to seriously impair the stands. For breaking this law, the forest owner was compelled to plant two trees for each one cut. These laws were dictated partly by the fear that excessive cutting would seriously reduce the taxable property in the country.

At the beginning of the last century a few new laws were passed, limiting the cutting in private forests, but these were inadequate to check excessive cutting, which at that time had taken place in parts of the country.

In 1886 Finland adopted a new forest law based on modern principles of forestry and aiming at a restriction of the cutting in locations where reforestation would be difficult, such as in certain sections of the coast districts, on islands, and in other places exposed to the elements. The law also made provisions in regard to the leaving of mother trees, but failed to stipulate the exact number of trees per acre. The law was, as a whole, indefinite in its provisions and never obtained any practical results, as the Government was not in a position to enforce it, owing to the lack of forest rangers and supervisers.

With the growth of the pulp industry excessive cutting increased every year, particularly in the immature forests. Excessive cutting prior to this time had been practically limited to mature stands, and there was soon a scarcity of timber of large dimensions in the most accessible forest regions of the country, while the increased demand from pulp mills, foreign mining companies, etc., for small-dimension timber led the forest owners to drain their young stands heavily.

PRESENT LAW REGULATING CUTTING.

From time to time voices were raised to prevent this injurious cutting, but it was not until December, 1917, that the present law was passed. The new law is similar to the Swedish so-called "young-forest law" and is based on the principle of compulsory reforestation. Paragraph 1 of the law reads as follows: "Young productive forests must not be cut unless such cutting is conducted in conformity with the principles of rational thinning. The forest floor must not be left in such a condition after the cutting as to impair the possibilities of the natural reproduction of the forest."

As conditions for artificial reproduction (planting and seeding) at times are unfavorable in Finland, the law especially stipulates that the forests must not be cut in such a way that the possibilities for natural reproduction will be impaired in any way. Of course, the law can not give definite stipulations regarding how the forests are to be cut in each section of the country. This matter is to be decided by local authorities. The law will, it is hoped, check the practice of cutting down young trees without regard to the rules of rational forestry.

The enforcement of this law will for some time to come greatly reduce the output of pit props (mine props), pulp wood, and small timber, which have been exported in large quantities. The beneficial effect of the law will no doubt be experienced in the future when the present stand of young forests have grown into mature stands, thereby yielding the owners a much larger return on their investments. While the future supply of sawlogs may be increased in the future, it is another question whether these mature stands will be cut for sawlogs or for pulp wood. This will depend upon the respective prices in the future for lumber, paper, and pulp.

SPECIAL PROVISIONS OF THE LAW.

The law makes several exceptions from the stipulations laid down in paragraph 1. Young forests may be cut clean if the cut-over land is intended for agricultural purposes or for buildings, etc. Young forests may also be cut if the timber is being used for the personal needs of the owner, such as for firewood, building material, etc., but such cutting must always be conducted with due regard to the natural reproduction of the forests.

In order to carry on a plan of intensive forestry, it is often necessary for the forest owner to cut his timber with less restriction than laid down in paragraph 1. It was not the intention of the law to prevent such intensive exploitation of the forests, and if the forest owner can submit a detailed plan of the intended cutting, extending through a certain period of time, and have this plan approved by a local officer appointed for this purpose, certain modifications of the law's provisions may be granted, provided the forest owner can offer the necessary guaranty that he will take adequate steps for the reproduction of the cut-over lands.

In each Province a special forest commission is in charge of the supervision of the cutting and the execution of the law. If it is evident that a forest area has been cut in such a way that the law has been broken, the commission will either deprive the owner for a time of the right to any further cutting on the total area of such forest or restrict the cutting on a part of the land. Necessary measures will be taken by the commission to reforest the cut-over area at the expense of the owner, if he shows unwillingness to do this work himself.

If the timber in a forest has been sold by the owner to be cut by another party, the person who contracted for the logging must report in detail to the local forest commission regarding the proposed plan for the cutting. The same rule regarding the reporting of proposed cutting of timber applies to the owner of a forest when he intends to cut timber on his holdings with a view to selling it to sawmills or other wood-using industrial establishments, or otherwise to exploit his timberland for commercial purposes.

ADMINISTRATION OF THE NEW LAW.

It is a noticeable fact that the Government has placed the matter of supervision in the hands of special forest commissions throughout the country who are conversant with local conditions and the problems of forest conservation. This seems to be a very practical measure, because it would be very difficult for the ordinary courts to decide whether the forest law had been violated, as it would be necessary to have detailed knowledge of the principles of forestry to pass judgment in each case.

The forest commissions, of which there is one in each Province, receive their orders from the Government Forest Service and work directly under it. The members are appointed for a period of three years and have several assistants. Each commission has three members, one appointed by the Forest Service and the other two by the Department of Agriculture. The Government defrays the expenses of the commissions. In every country or commune there is a local forest commission reporting to the provincial forest commission. Their expenses are paid by the county or commune where they operate. In case a forest owner refuses to obey the orders of the provincial forest commission, the matter is referred to the courts.

This new law seems to be a very suitable one for the conditions in Finland. It may not, until later, work out exactly as intended in all parts of the country, because it may be difficult at the start to obtain commission members capable of deciding in each case when excess cutting has taken place. The distances are great and the population scattered, and this circumstance may in many cases cause considerable delay in passing on the many permits regarding cutting.

By comparing the new Finnish forest laws with the Swedish and Norwegian laws it is seen that the Finnish laws are less strict than the Swedish, but more severe than the laws in Norway. The Norwegian laws are based on the dimension of trees, which is considered less satisfactory. Comparing conditions in Finland and in Scandinavia with those in other countries, where strong opposition is raised against any control of private timber lands and their management, interesting to note that the forest owners in Finland, as well as way and Sweden, have loyally accepted the restrictions regard-

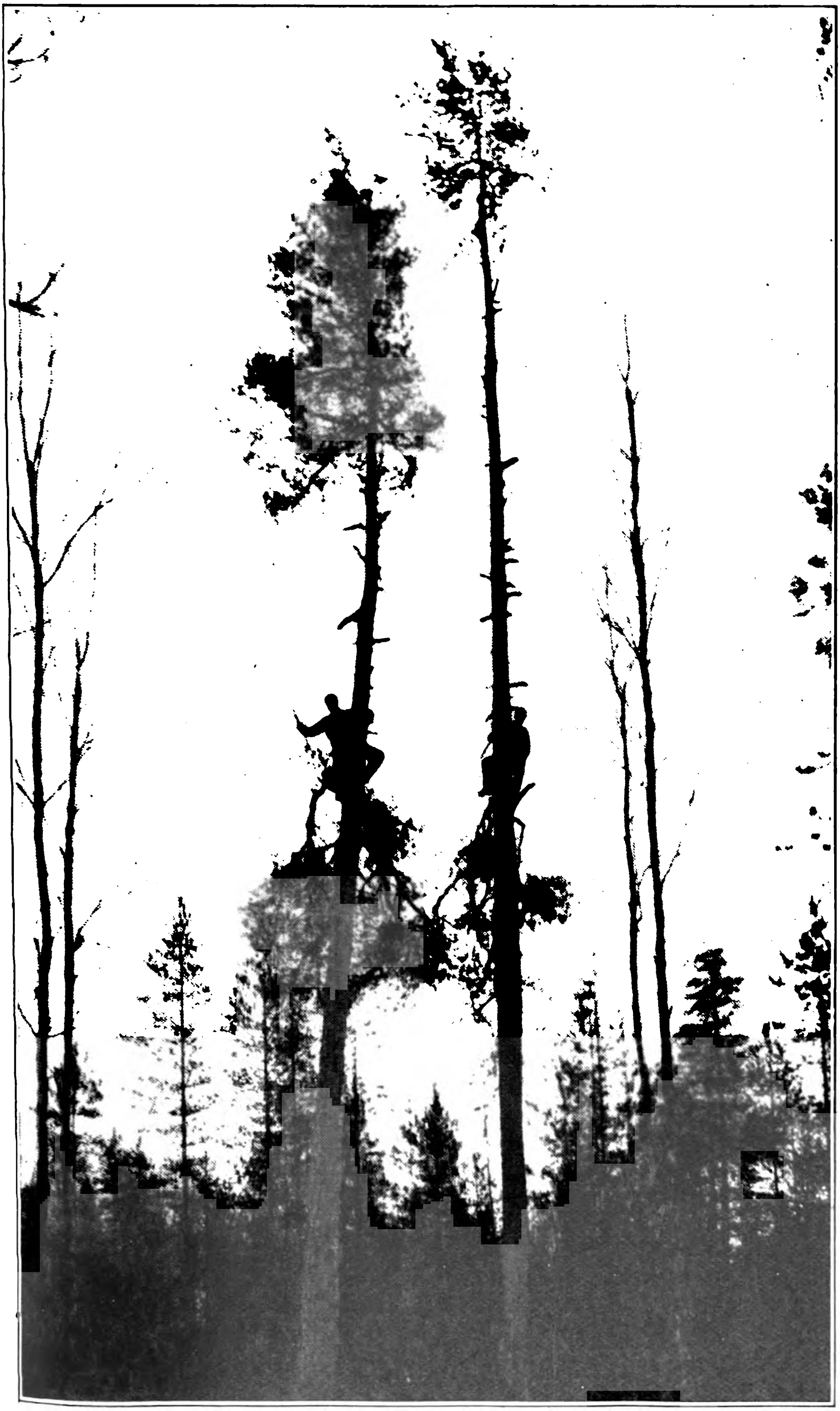

FIG. 7.—LIMBING OF TREES BEFORE FELLING TO AVOID DAMAGE TO SURROUNDING YOUNG GROWTH.

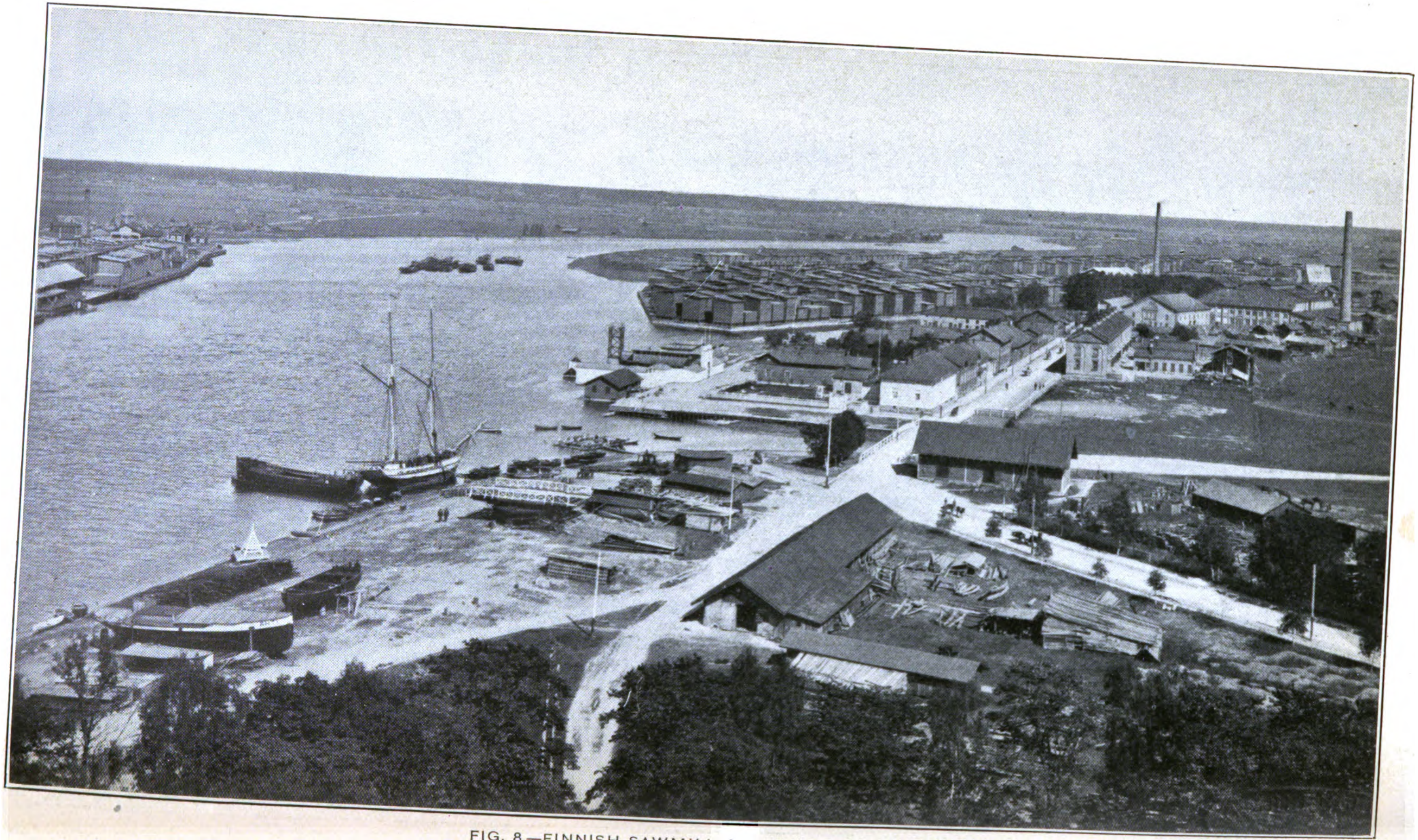

FIG. 8.—FINNISH SAWMILL, YARD, AND DOCKS.

ing cutting on their holdings, because they realize that they will be benefited in the end and that the nation's timber supply will be safeguarded for all time to come.

The promiscuous cutting of forests with no thought of what is going to happen "when the sun gets cold" is a thing of the past in these countries, and there is a determination to look out for their perpetuation, because, as mentioned before, the forests are the principal national asset in each of these countries.

PROTECTION FORESTS.

In both Sweden and Norway considerable areas of forest lands have been set aside for the protection of adjacent agricultural lands, as screens against sand storms, etc. In Finland the necessity for setting aside such forest areas is not so great. In the extreme north the Government has restricted the cutting on an area of about 7,907,000 acres, including inland waters. This area is located in the semi-Arctic regions of northern Finland at a considerable altitude, and it is felt that the coniferous forests now growing would be replaced by practically worthless brush and shrubs if these areas were cut to excess.

At the present time only about 3 per cent of the protection forests are privately owned and the remainder Government owned. In the near future this protection-forest area will be surveyed and divided among the different owners, and it is expected that the portion in private ownership will be reduced to one-fifth of 1 per cent. At present this region offers very little of interest to the lumber industry, on account of the difficulty of floating the logs to the sawmill districts.

VALUES OF TIMBERLAND.

Most of the timber holdings of the large lumber companies were acquired decades ago, usually at a very low cost. As an example, it may be mentioned that one company in southern Finland bought a tract of timberland for $1,900 fifty years ago. Since that time the company has taken from this land timber valued at $58,000 and at the present time the property is worth at least $100,000. There are many similar cases.

It is very difficult to pronounce in general upon the value of timberlands, because local conditions in each district determine the price. Generally speaking, the following prices per acre were applicable to mature forests, with good stands, in 1916 and 1917:

Age of stand.	Southern Finland.	Central Finland.	Northern Finland.
60 years	$39.00	$28.00	$20.00
80 years	55.00	43.00	31.00
100 years	66.00	55.00	39.00
120 years	78.00	66.00	47.00

Young and immature forests were valued at $5 to $15 per acre. The present value of all lands is at least 100 per cent higher.

LOANS ON FOREST LANDS.

There are a few financial institutions in Finland granting loans with forest lands as security. As a rule, these companies do not make loans exceeding 60 per cent of the total value of the land and forests combined, provided that the forests are insured against fire. If the property is not insured, the loans granted represent a smaller percentage of the value. The companies do not grant any loans against the forests alone as security. The companies exercise control over the cutting, etc., during the period of the loan.

The banking system and the facilities for making loans were not satisfactory in the early days of the lumber industry, and the farmers possessing timberlands were unable to raise money by pledging their forest lands as security. These farmers could not easily exploit their forests, and this circumstance largely explains why the sawmills have succeeded in acquiring large areas of forest lands at very low prices.

TAXES.

The taxes in Finland, before the war, were lighter than in any other country in Europe, and the total amount of taxes paid by the lumber industry did not amount to more than a very small percentage of the total income. The property tax was practically negligible. These low taxes were due to the fact that the country had very small expenditures, as Finland was not obliged to maintain a standing military force or representatives in foreign countries during the Russian régime.

The taxes at the present time are very high, and in some cases may amount to 35 or 40 per cent on incomes in excess of 1,000,000 marks ($193,000 at par value). The income taxes vary a great deal in the different parts of the country, and may be anywhere from 5 to 30 per cent, the usual tax being 10 to 15 per cent. There is practically no tax on standing timber. The taxes are paid when such timber is cut and are based on the profit realized from its sale.

The system of taxation seems to have been established in such a way that it would not lead to excessive cutting. In the near future the taxes will likely be increased. A special tax is levied on the exportation of wood products. This tax will be discussed in a later chapter.

FOREST FIRES.

The forest fires nowadays are not so serious as they were in former times, when little attention was paid to the value of the forests and the checking of forest fires. - Climatic conditions and the absence of underbrush in the forests in Finland do not offer the same difficulty in regard to forest fires as in the United States. There are no reliable statistics covering the fires in privately owned forests. The only statistics available cover fires in the State forests. During the last decade the average annual value of the timber burned is estimated at approximately $77,000.

Finland is one of the few countries in Europe that has a system of forest fire insurance. A private company started in 1914 works on a plan which is a combination of the Norwegian and German systems.

The Finnish fire insurance plan covers the following four categories: Category No. 1, young forests with trees less than 5 inches in diameter measured 18 feet from the ground; category No. 2, mature forests with trees 5 inches in diameter and over at 18 feet from the ground; category No. 3, both young and mature forests; category No. 4, forest products. Young forests may be insured for the standing trees alone or the insurance may also cover the cost of reproducing the burned-over areas of young forests. In the latter case the insurance covers only stands 15 years of age or less. The insurance of forest products covers logs, etc., during the time they remain in the forest. The insurance covering standing forests includes damage done to the forest floor by fire, if such fire impairs the soil for reforestation.

The premium per $1,000 of insurance is as follows: Category No. 1, $1.25 to $1.75 for standing timber and $3.50 to $4 for reproduction of burned-over forest lands; category No. 2, $0.75 to $1.20; category No. 3, $1.10 to $1.50; category No. 4, $5 to $6. Special discounts are given in districts having efficient fire patrol systems. In addition to the regular premium, an extra premium of 50 cents per $1,000 of insurance is charged during the first year.

This forest-fire insurance company is a mutual company and has had considerable success in Finland. In 1914 the value of the property insured was only $7,000,000, but in 1917 the value increased to $20,000,000.

FOREST SCHOOLS AND INSTITUTES.

At the University of Helsingfors there is a branch devoted to the teaching of scientific methods of forestry and related subjects. The course lasts from three to four years. During the summer months part of the time is usually devoted to work in the field, excursions, etc. The graduates from these courses usually enter the Government forest service. Recently an experimental laboratory devoted to scientific research work was started in connection with this university. These institutions are operated by the Government, and the tuition is practically free.

In order to train students for positions as forest wardens, rangers, and minor positions of a similar nature the Government has established five forest schools in different parts of the country. The courses in these schools last from one to two years and cover the following subjects: Forest management, cruising, geology, technology, botany, zoology, surveying, law, and other subjects in connection with forestry. The students also obtain practical experience in the field. These schools are usually located in the State forests, and the tuition is free.

The lack of the necessary funds has to some extent been a drawback for the Government forest schools and institutions. There are no facilities for testing of timbers and comparatively little research work has been done in connection with forests. The lack of such facilities is keenly realized, however, and in the future more time and money will be devoted to such purposes.

There are a few forest associations in Finland that have done a great deal of good by spreading information about the forests. Recently several lumber and pulp companies, holding large areas of cut-over lands and farm lands, have formed agricultural associations to work for the development of their holdings.

ANNUAL INCREMENT AND CONSUMPTION OF TIMBER.

In Finland, as in the Scandinavian countries, the large domestic consumption of wood in connection with the steadily increasing quantities exported has given considerable anxiety, and it is feared that the nation's future timber supply may be threatened. In order to prevent such conditions, several laws have been passed from time to time aiming at a restriction of the cutting on privately owned timber lands, but these laws were not sufficiently stringent to check the excessive cutting.

ANNUAL INCREMENT.

During the war a commission made a study of this question, but the lack of adequate statistical material covering the annual growth and stands of private forests was a serious drawback in reaching a conclusion, and the results of the investigation must therefore be considered more or less as estimates. The results for private forests were as follows:

Provinces.	Productive forest land.		Inferior forest land.	
	Annual increment per acre.	Total.	Annual increment per acre.	Total.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Nyland and Abo	43	289,075,000		
Tavastehus	42	89,686,000		
Viborg	43	166,132,000	15.5	23,227,000
Kuopio	42	152,380,000		
Wasa	40	132,502,000		
Total, southern Finland		829,775,000		23,227,000
Uleaborg	21	190,350,000	11	4,871,000
Total, Finland		1,020,125,000		28,098,000

The total annual increment in all forests was given as follows:

Divisions.	Privately owned forests.	State-owned forests.	Total.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*
Northern Finland	195,244,000	141,200,000	336,444,000
Southern Finland	852,989,000	52,950,000	905,939,000
Total	1,048,233,000	194,150,000	1,242,383,000

CONSUMPTION.

The following statement, based on official statistics, gives the quantities of wood used by the various industries, quantities of wood exported, and the domestic consumption in cities and rural districts in 1913:

	Cubic feet.
Export of timber, logs, etc	139,955,000
Wood used as raw material by industries	320,420,000
Consumption of wood in rural districts	538,364,000
Consumption of wood in cities	45,827,000
Consumption of wood by railroads	28,572,000
Consumption of wood by telegraph and telephone companies	17,650,000
Consumption of wood as fuel in factories	105,900,000
Total	1,196,688,000

The wood used by the industrial plants in 1913 was distributed as follows:

Industries.	Sawlogs.	Pulp wood.	Birch props.	Birch and aspen logs.	Firewood and charcoal wood.	Total.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Sawmills and planing mills	241,805,000				1,943,000	243,748,000
Plants for making fuel					2,256,000	2,256,000
Bobbin factories			11,304,000			11,304,000
Veneer plants			398,000			398,000
Excelsior factories				124,000		124,000
Ski factories				35,000		35,000
Mechanical pulp mills		20,649,000				20,649,000
Cellulose mills		37,944,000				37,944,000
Tar plants					1,301,000	1,396,000
Match factories				187,000		187,000
Charcoal plants					2,379,000	2,379,000
Total	241,805,000	58,593,000	11,702,000	346,000	7,879,000	[a] 320,420,000

[a] Includes 95,000 cubic feet of stumps used by the tar plants.

EXPORTS OF TIMBER.

The quantities of timber exported from Finland in 1913 were as follows:

	Cubic feet.
Round timber, logs, masts, etc	18,348,000
Hewn timber	10,986,000
Railway ties and similar stock	2,118,000
Props	64,189,000
Pulp wood	17,962,000
Firewood of pine and spruce	6,318,000
Firewood of hardwoods	20,034,000
Total	139,955,000

RELATION OF INCREMENT TO CONSUMPTION.

The total quantity of wood from Finnish forests consumed and exported is given as 1,196,688,000 cubic feet in 1913. This figure, however, does not include the top logs and similar waste left in the forests. The commission estimated this waste at about 10 per cent, and taking this quantity into consideration, the total annual cut would be as follows: Southern Finland, 1,154,627,000 cubic feet; northern Finland, 162,037,000 cubic feet; total, 1,316,664,000 cubic feet. No consideration has been given to the timber destroyed by fire, windfall, etc., so the above estimate may be considered as the minimum quantity cut.

In northern Finland the annual increment is in excess of the annual cut, as shown by the following figures:

	Cubic feet.
Annual increment in State-owned forests	141,200,000
Annual increment in privately owned forests	195,244,000
Total, northern Finland	336,444,000
Total consumption in northern Finland	162,037,000
Annual growth in excess of annual cut	174,407,000

In the forests of northern Finland practically only sawlogs have been produced so far, because the facilities for the transportation of small logs has been unsatisfactory and the cost high. It is supposed that considerable time will elapse before the rivers will be put in such condition in this part of Finland as to enable the forest owners to economically transport the small-dimension timber to the coast, where it can be utilized for pulp, props, etc. This particularly applies to the extreme northern and northeastern sections of Finland. In the coastal districts these conditions do not apply.

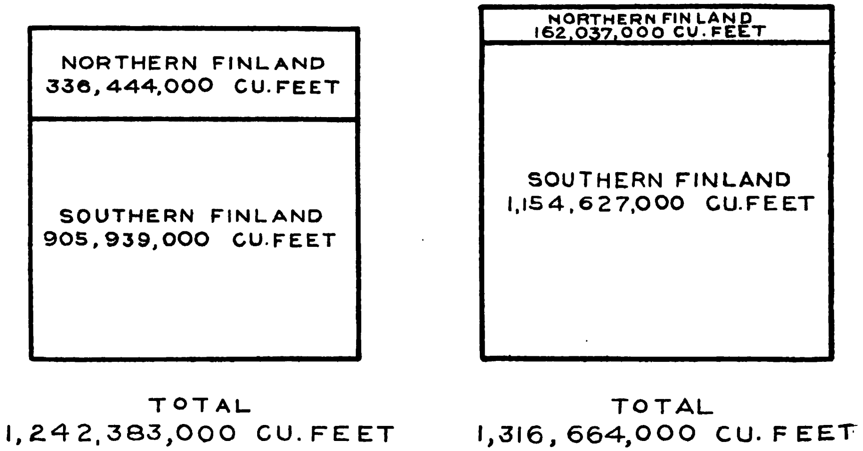

FIG. 9.—Annual increment (left) and annual cut (right) in Finnish forests.

In southern Finland a heavy excess cutting has evidently taken place in most of the forests, with the exception of those belonging to cities and counties and the majority of the forests in the hands of the larger industrial concerns. The area of the forests in southern Finland that are supposed not to have been cut in excess of the annual increment is about as follows: Productive forest land, 5,986,000 acres; inferior forest land, 1,144,000 acres; total, 7,130,000 acres. The remaining 18,000,000 acres have been cut in excess of the annual growth. The latter figure represents more than 70 per cent of the total forest area of southern Finland.

The total quantity of timber cut in excess of the annual growth in southern Finland is estimated at 247,000,000 cubic feet. The excess cutting for the whole country would be approximately 73,000,000 cubic feet. These figures relate to prewar conditions.

During the war Finland was almost entirely cut off from the world's markets and could not obtain the customary supply of fuel for its factories and railroads. This was also true of certain sections of the Baltic Provinces of Russia, and Finland was called upon to supply large quantities of firewood. Even after the war ended the Finnish forests were heavily taxed to supply firewood, because the importation of coal and coke has been limited by the scarcity of ships. Furthermore, the fuel has generally not been properly dried and consequently about 30 per cent more wood was required to give the same amount of heat as dry wood. The prices for pulp, paper, and similar wood products requiring small-dimension timber as raw material have increased very materially and this has stimulated production. It is expected that the demand for small timber will increase, and the commission has estimated that this increase will amount to approximately 210,000,000 cubic feet per year, unless measures are taken to prevent the cutting of young forests.

Before the war Russia supplied large quantities of props and pulp wood, but is not expected to be in a position to furnish these commodities for some time to come. In Sweden strict laws prevent the cutting of young forests and very small quantities of pulp wood and props for export may be counted on from this source. It is, therefore, very likely that Finland will be called upon to furnish increased quantities of such material. To what extent the new forest law of 1917 will interfere with the cutting is a matter of uncertainty. Heavy export duties have recently been imposed upon small-dimension timber, and these will largely check the output of such stock for export.

LOGGING OPERATIONS.

There are different ways in which the lumber mills obtain their log supply. They may buy standing timber from individual forest owners and remove the timber themselves, or they may buy in the open market logs cut by individual forest owners, and to some extent those cut by the Government. They may also buy standing timber in the State forests and log this timber themselves. The majority of the Finnish sawmils have large areas of forest and and do their own logging, but usually all mills obtain at least part of their logs from other sources than their own forests.

PURCHASE OF STANDING TIMBER ON PRIVATE LANDS.

The majority of individual forest owners generally make contracts with saw or pulp mills for the cutting of the timber on their lands. Formerly these contracts were made in a very haphazard way, the forest owner making no effort to ascertain the exact quantity of the standing timber which he sold, and the companies were generally able to make very advantageous contracts, because they had a better understanding of the value of timber than the owners. During the war the farmers and individual forest owners prospered, and the increased value of forest products taught them to be more careful in estimating the value of their timber. A great many forest owners now have their lands cruised before letting contracts and the mills must now, as a rule, pay the price which the timber is worth. In some sections of the country, however, the competition between the mills is not as keen as might be expected. The mills cooperate in some instances in the purchase of timber in order to avoid detrimental competition. In one district the purchases of timber and logs are made through one central organization representing the majority of the pulp and saw mills. These conditions are very different from those in Scandinavia, where the timber supply is more limited in proportion to the number of mills.

Formerly the contracts made for the cutting of the timber in private forests extended through a period of several years, but the terms have lately been brought down to about 3 to 5 years.

Following is a sample of an agreement contracting for the cutting of timber on privately owned forest land:

1. The trees to be cut shall be selected and marked jointly by buyer and seller before the cutting season commences and each tree shall be provided with the buyer's brand at breast height and with the seller's brand as close to the root as possible, so that that the seller's brand will be left on the stump after the tree has been cut. The height of the stump must not exceed 3 inches from the ground.
2. This contract expires five years from date, and if trees which have been marked for cutting remain uncut at the expiration of this contract, they shall be considered the property of the seller, unless war, strikes, and unfavorable conditions beyond the buyer's control should prevent the logging operations. In such cases reasonable extension of time will be granted.
3. During the logging operations the buyer must exercise great care not to cause any damage to the young forest or to the cultivated areas in the logging regions, but if trees not marked for cutting hamper the cutting of marked trees, the buyer may cut these unmarked trees. Such trees shall not be removed from the forest, as they shall be considered as the seller's property. A fine of $---- per tree is to be paid in case any neglect is shown by the buyer in felling unmarked trees.
4. The buyer may utilize top logs down to a top diameter of 4 inches. The balance of the top logs and branches and bark of the trees cut shall be considered as the property of the seller and the buyer must leave these in the forest.
5. On the seller's property the buyer has free access to the necessary roads and storage space for his logs and also free use of the rivers for floating purposes. The necessary small logs and poles to be used for the hauling of timber may be taken free of charge in the forest, but hardwoods shall be taken in preference to coniferous species whenever possible. If any damage is done to fences, these must be repaired by the buyer.

It is evident that a cutting system which is exclusively based on the principle of cutting out the trees in excess of a certain diameter at breast height, leaving all the scrubby growth in the forest, is a very unsatisfactory way of cutting from the standpoint of rational forestry. Not only saw timbers are cut, but even saplings down to 4 inches diameter at breast height are often contracted for by pulp mills and props dealers.

TIMBER CONTRACTS IN STATE FORESTS.

Every year the Government sells large quantities of standing timber for cutting in the State forests. A guaranty is required for the execution of the contract at the time the bids are made and the time set for the logging is usually three years. (Further information and statistics in regard to these auction sales may be found on p. 34.)

The competition for the purchase of Government timber is not always equally keen. In certain parts of the country there may be only three or four mills interested in these contracts, and it is not very difficult for the owners of these mills to come together and decide on how to divide the timber supply among them and also at what price. The Government, however, has done whatever it could to check these practices and in a great many cases the bids are considered too low and are not accepted. The timber is left standing in preference to having it cut at unsatisfactory prices. The competition in northern Finland has at times been particularly slack, and in order to stimulate timber prices the Government has encouraged new industries in that part of the country. It has also done a great deal toward improvement of various floating rivers. For some years past large quantities of saw timber has been sold to Swedish mills, whereby the prices paid for Government timber have been somewhat increased. In other cases, however, the prices obtained for Government timber have been very low for reasons other than those mentioned. The quantities offered for sale may have been in excess of what the market could absorb, and the cost of transportation of the logs from the forest to the nearest mills may in many cases have been almost prohibitive.

The importance of the State forests to the lumber industry is seen from the fact that at the present time at least 25 per cent of all sawlogs are supplied from the State forests. Some small quantities of sawlogs have been cut by the Government and sold in the open market.

TIMBER SUPPLY FROM PRIVATE FORESTS.

Nearly all the larger Finnish sawmills have extensive timber holdings. The mills generally use very conservative cutting methods in their own forests. The larger mills employ forest experts and the milling and logging are entirely separated. A careful plan, extending through several years, is prepared, with due regard to the young growth and the reforestation problems. The amount of cutting in forests owned by the mills is largely dependent upon the prices of stumpage. If stumpage values are low the mills prefer to contract for timber in other forests and save their own holdings.

FELLING OF TREES.

Trees selected for cutting are carefully marked in advance of each logging season. The felling of the trees starts as soon as the first snow has fallen and the ground is frozen. Sawlogs are never cut during the spring, summer, or autumn on account of the danger of having the logs discolor. Climatic conditions vary a great deal in different parts of the country, and therefore the duration of the logging operations ranges from three to five months. As a general rule, it may be said that the logging operations start in November or December and end in March or April. In the northern sections of the country logging may begin in October. During extreme cold weather the felling of trees is suspended, because the wood becomes brittle and there is danger of its breaking.

The logging operations in Finland are carried on in about the same way as in Scandinavia, although the type of equipment may vary slightly on account of the different topographical conditions of these countries. Except in one case in northern Finland, where American tractors of the caterpillar type are used for hauling logs, no machinery of any kind is used in the logging operations in Finland.

All logging is done on a contract basis, the sawmills giving the contract at auction to the lowest bidder, and the foremen taking such contracts hire their own crews. Logging crews vary in size and may consist of six cutters and three drivers. The crews furnish their own horses, equipment, and food. The forest area to be logged is divided into several small lots, ranging from 50 to 400 trees per lot, and a logging crew is assigned to each lot. The pay of the men is based either on the number of logs cut or on cubical contents.

Saws are generally used in felling trees. The stumps are cut very low on Government timberland and in the better-managed privately owned forests. The stumps in such forests are seldom higher than 3 or 4 inches above the ground. In other cases stumps may be left as high as 10 or 15 inches.

In the State forests the trees are at times limbed before they are felled in order to prevent damage to the surrounding young growth. In nearly all cases the logs are barked before they are floated, for the same reasons as outlined in the report on Swedish forests.[1] Barking is compulsory by law, but exceptions are made in some cases.

The following table shows (according to Prof. Helander) the average number of 16-foot logs which one man can bark in 10 hours:

Top diameter.	Logs.	Top diameter.	Logs.
Inches.		*Inches.*	
5	88	10	39
6	58	11	35
7	50	12	32
8	47	13	29
9	43	14	21

It is difficult to give any general statement in regard to the quantity of logs that one man can cut in a day, because this varies a great deal according to local conditions.

Not until lately have the larger logging operators in Finland employed specially trained cross cutters in order to obtain the log dimensions that would yield the best possible results when sawed into lumber. Generally this important work is neglected and the cross cutting is usually left to the ordinary loggers.[2]

On account of the difficulty of transportation, the utilization of the waste products in the forests is often difficult. Many mills find it profitable not to cross-cut logs in the forests, but to float the timber in entire tree lengths and have the logs cross cut at the mill. This is particularly the case where the mills also operate pulp mills and the floating conditions are favorable. The burning of waste into charcoal is practiced in many parts of the country.

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[1] See Special Agents Series No. 195, Swedish Forests, Lumber Industry, and Lumber Export Trade, p. 69.

[2] See also Special Agents Series No. 195, Swedish Forests, Lumber Industry, and Lumber Export Trade, p. 70.

LOG DIMENSIONS.

At the start of the lumber industry on a large scale, about the middle of the last century, only the largest and best trees were cut and timber measuring less than 10 or 11 inches at 18 feet from the ground was left in the forests. As the supply of the large-dimension trees gradually diminished, trees of smaller dimensions were cut. Later on, with the advent of the pulp and paper industries, the call for smaller logs increased very materially.

As a rule, not more than two sawlogs of 18 to 20 feet are produced from one tree. The logs are generally cut with an excess of 4 to 6 inches in length to provide for damage to the ends during floating. The logs are all cut according to the English standards of measurement, to odd and even feet in length and on the half-inch top diameter. The logs are measured in cubic feet based on the top diameter. Generally speaking, the log dimensions are heavier in Finland than in Scandinavia, particularly in the northern part of the country.

The following table gives an estimate of the sawlog dimensions in the various parts of Finland, based on the log supplies of standard export mills:

Districts.	Range.	Top diameter.	Length.
		Inches.	*Feet.*
Kymmene River district (southern Finland)	Maximum	15	36
	Minimum	5	14
	Average	7½	19-20
Southeastern districts	Maximum	12	30
	Minimum	5	16
	Average	7	19-20
South and central west coast districts	Maximum	17	34
	Minimum	4½	12
	Average	6½-7	16-19
Northwest districts	Maximum	15-17	32
	Minimum	6	15
	Average	8	22

In the southern and southwestern coastal districts the log lengths are usually very short, but a great many logs from other sections of the country, particularly from northern Finland, are mixed with the timber from these coastal districts, thereby giving higher average dimensions than is customarily obtained from forests in these regions.

As a rule, it may be said that the average length of logs in Finland is about 19 feet and the average top diameter from 7 to 7½ inches. The length of the logs in each district is dependent upon the conditions of floating, because long logs are easily broken and the cost of floating such logs is usually disproportionally higher than that for standard logs. The minimum top diameter of sawlogs may be said to be 5 inches in regions close to the mills where the cost of transportation is reasonable. It is evident, however, that in districts located at a great distance from the mill the minimum log diameter must be larger on account of higher cost of transportation. Logs longer than 35 feet can not practically be floated in Finland, and the tendency is to cut shorter lengths than has been done heretofore in order to save waste in the mills on account of the taper being smaller. The favored top dimensions are 9½, 10, 11, 11½, and 13 inches. These dimensions will yield lumber of such dimensions as are most in demand. The logs are generally "drawn out" to 4 inches at the top and the remainder is cut into firewood, props, etc.

HAULING OF LOGS.

The thousands of rivers and lakes in all parts of Finland greatly facilitate logging operations. Generally speaking, the maximum distance from the place where the logging operations are carried on to the nearest waterway is seldom in excess of 7 or 10 miles and the average distance may be about 2 to 2½ miles. In exceptional cases the distance may be 15 to 20 miles. Furthermore, the country is fairly level and no such steep hills and mountainous regions are found in the forest area of Finland as are frequently seen in Norway. Therefore, conditions for hauling logs are favorable.

Before the war horses used in logging were plentiful and cheap. The average price of draft horses used in the forests was approximately from 400 to 700 marks ($77 to $135) before the war. During the latter part of the war such horses frequently sold at 6,000 to 7,000 marks ($1,116 to $1,350 at par value). On account of the difficulty of securing feed, the number of horses in Finland decreased materially during the war, hence the rise in price.

The snowfall in Finland is very much lighter than in Sweden and Norway, and the hauling of logs is therefore not so difficult, unless the snowfall is exceptionally light, which may hamper the operations considerably. In Sweden and Norway, on account of the heavy snow cover, it is necessary to assemble the logs at one central point before they are driven to the river bank, but this is not necessary in Finland and the logs are hauled direct from the place where they are felled to the river bank.

The average number of sleigh loads hauled per day of 10 hours, for different distances, may be seen from the following statement (according to Prof. Helander):

	Loads.
One-half mile	11–14
One and one-fourth miles	6–10
One and three-fourths miles	6– 8
Two and one-half miles	4
Three to three and one-half miles	3
Four and one-fourth to five miles	2
Five and one-half miles and over	1

The loads may vary from 35 cubic feet on short hauls to 45 or 50 cubic feet on longer distances. The loads generally contain from 6 to 10 logs, according to size. On short distances the loads are made smaller because better time is made in this way.

On account of the favorable topographical conditions for log hauling, it is believed that improvements could be made in the overland transportation of logs. Such tractors as are used in the forest regions of the Lake States in the United States would no doubt be suitable in Finland, if operated properly and a suitable type were selected. The present method of hauling logs with horses is very expensive, because both feed and supplies must often be carried a great distance into the interior sections, particularly in northern

Finland, where the population is very scattered. The cost of horses and feed may eventually be less than at present, but it will probably never reach the prewar level. There is also a possibility for logging railroads of a light type to be used in certain parts of the country

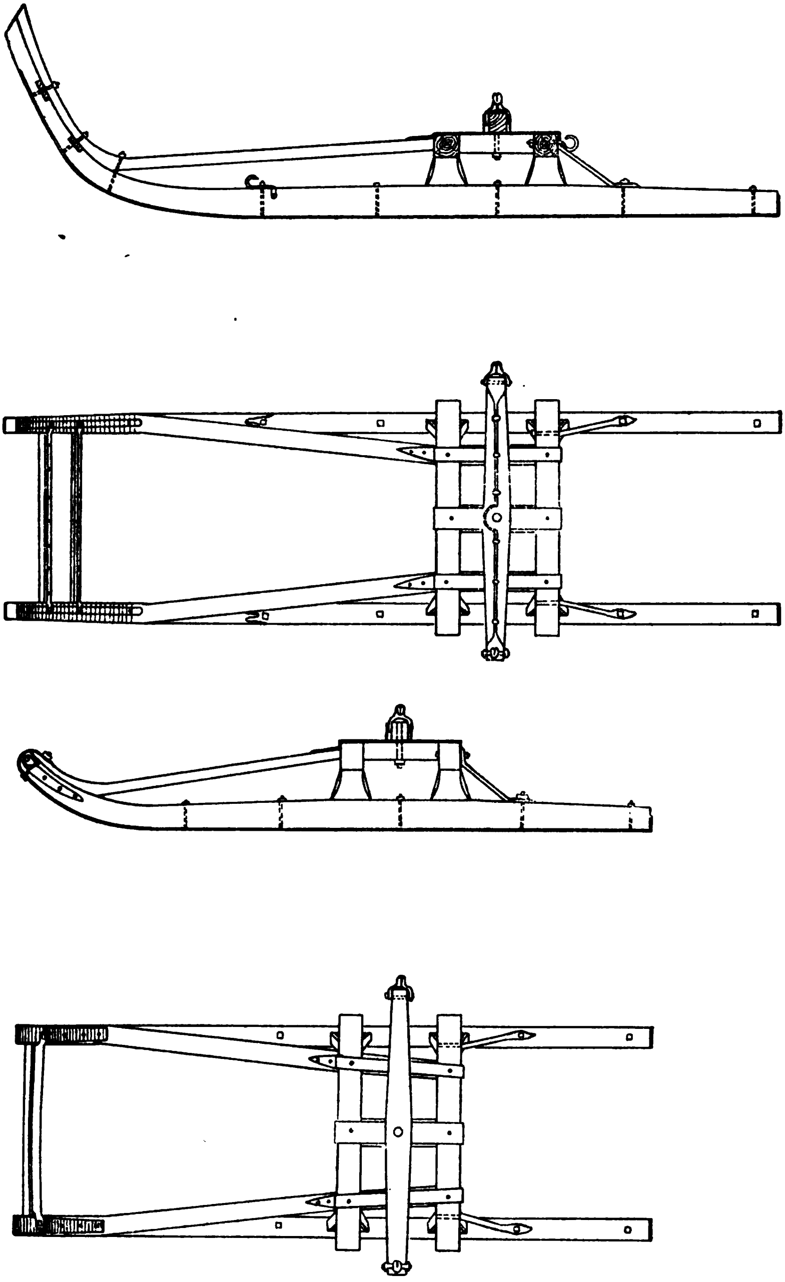

FIG. 10.—Sleighs used for log driving in southern Finland.

where the stands are dense and the cut per acre would justify the expenditure.

WAGES OF LOGGERS.

There are at least 100,000 men employed in logging operations in the forests. The majority of the loggers are usually of a shiftless disposition, moving from one part of the country to another. Some of them have small farms or are tenants. The living conditions of these loggers have often, in times past, been unsatisfactory, but their standards of living are much lower than that of people of the same class in the United States. The wages paid to loggers before the war were very low, but the cost of living in Finland before the war was one of the lowest in Europe.

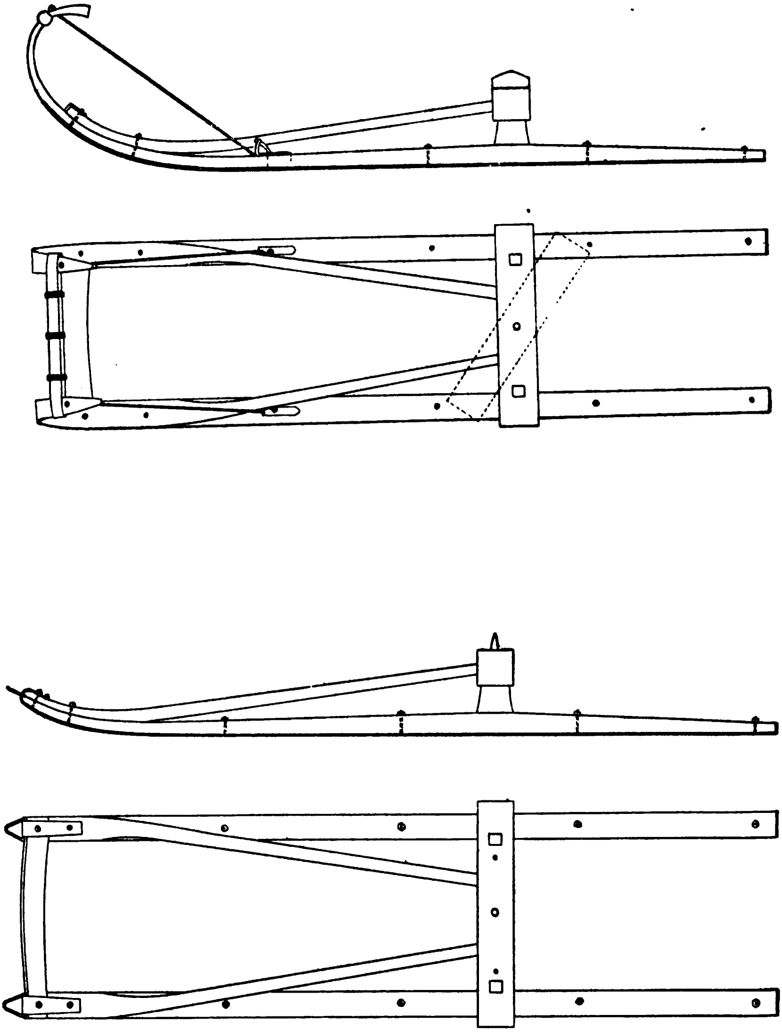

FIG. 11.—Sleighs used for log driving in northern Finland.

The following figures, compiled from Finnish official statistics, show the minimum and maximum wages per day paid in the various regions of the country before the war: Loggers, $0.22 to $1.16, average $0.60; drivers, supplying their own horse and horse feed, $0.74 to $2.70, average $1.50. These wages do not include board and room. Special crosscutters and foremen received considerably more, approximately $35 per month. In comparing these figures with the wages in other countries it is not fair to pass judgment without giving due consideration to the low cost of living in Finland.

During the war the cost of labor advanced considerably, but not in proportion to the cost of living. Cutters in the forests, during the winter 1919, made on an average 20 to 25 marks ($3.86 to $4.83 at par value), and drivers furnishing their own horses were paid as high as 50 to 75 marks and even 100 marks ($8.65, $14.48, and $19.30) per day.

The logging operations were greatly curtailed during the latter part of the war, as both horses and men were underfed for months, and weakened to such an extent that they were unable to do heavy work. It was reported that in the interior and eastern sections of Finland the logging companies had to suspend operations because the loggers were too weak to work. It is likely that the efficiency of horses and men in the forests decreased at least 30 to 40 per cent during the war period.

On account of the difficult labor conditions in Finland and the social unrest, particularly during the last few years, many of the larger forest owners are now taking steps to improve the living conditions of their men. This is done with a view to securing a permanent supply of loggers resident in their forest regions, as is found in many parts of Sweden and Norway. During the war it was extremely difficult to obtain the necessary food supplies for the men in the forests, and in order to carry on the logging operations the sawmill companies often had to supply the men with food. Cases were reported where as much as 1,000,000 marks ($193,000 at par value) was paid by one company toward the securing of food for the loggers in one year.

STUMPAGE VALUES.

Stumpage values necessarily vary to a great extent in Finland. The forests near the sawmills with good transportation facilities naturally have a higher value than the forests in the interior. The quality of the timber also influences the price of stumpage. It has been difficult to arrive at any conclusion in regard to the value of stumpage, because the Finnish mills have generally a very defective system of figuring the cost of production, and a great many mills are not in a position to tell whether they lose or make any money on the operation.

When the lumber industry started, about 50 years ago, spruce was not cut, as it was considered inferior to pine for construction purposes. Later on, with the advent of the pulp industry, using spruce as its chief raw material, the demand for this species increased, and a few years before the war spruce stumpage was worth only about 10 per cent less than pine, because the lumbermen had learned about the splendid quality of spruce for purposes for which this wood is especially adapted, such as box material, interior finish, joinery, etc. Spruce stumpage had at times before the war been sold at the same price as pine.

A fairly good estimate of stumpage values in the different sections of the country may be obtained from the table (p. 35) showing the prices paid at auction sales for Government timber, but these prices may be considered somewhat lower than the average market prices for reasons previously stated.

How the log dimensions affect the value per cubic foot may be seen from the scale of prices generally applied when purchasing sawlogs in southern Finland. The price is based on logs of 10-inch top diameter. For logs over 10 inches in top diameter no increase in price is given, but for logs under 10 inches $0.0097 per cubic foot is deducted for each inch under 10. For instance, if 10-inch logs are worth $0.097 per cubic foot, 9-inch logs are worth $0.087; 8-inch, $0.077; 7-inch, $0.068; 6-inch, $0.058; and 5-inch, $0.049.

The average stumpage value before the war seems to have been approximately 0.20 to 0.40 marks ($0.039 to $0.077) per cubic foot, but the cost varied considerably according to location, quality, and dimension. During the war the values increased many fold, and it is impossible to give any statistics, because prices varied more than 100 per cent in the course of a short time. It is understood that during the winter of 1918–19 the mills figured on stumpage values ranging from 0.78 to 1.30 marks ($0.15 to $0.25) per cubic foot. Under present circumstances the mills find it profitable to cut the timber in their own forests, while formerly it paid them better in many cases to buy standing timber in other forests because the stumpage values were very low.

COST OF LOGGING.

The cost of logging varies as much as the cost of stumpage, and no two companies have the same costs. The logging operations may vary as much as 40 to 50 per cent in the same localities.

In order to arrive at an average for the whole country, one of the principal districts in southern Finland, in which the cost of labor was moderate before the war, has been made the basis of this investigation. The results are shown in detail in the following table:

Items.	Cost per cubic foot.	
	1913–14	1918–19
Stumpage	$0.050–$0.058	$0.193–$0.241
Cutting, limbing, and barking	.007– .010	.031– .042
Hauling of logs, average distance 3½ miles	.010– .012	.106– .125
Floating	.013– .014	.039– .048
Towing of logs from river to mill	.002– .004	.006– .008
Loss by sunken logs and minor expenses	.005– .006	.015– .020
Interest on logs during logging and floating period	.007– .008	.027– .033
Total	.094– .112	.417– .517

The average prewar cost was about $0.097 per cubic foot for logs delivered at the mill. The average cost in 1918–19 was about 2.45 marks ($0.473) per cubic foot. This heavy increase started in the latter part of 1916.

In other districts of Finland the approximate prewar cost per cubic foot of logs in pond at mills was as follows: Southeastern Finland, $0.092 to $0.096; southwestern and central western Finland, $0.085 to $0.103; northwestern Finland, $0.077 to $0.082. In 1918–19 the cost was at least 300 to 500 per cent higher.

There is practically no way of finding out the exact cost of logs in ponds during the winter of 1918–19, and very small quantities were taken out of the forests. Logging conditions were so abnormal and varied so much in different sections of the country that no satisfactory result in estimating the cost of logs in pond could be obtained. As the mills cut largely from their own forests during the war the stumpage values given for this time are necessarily arbitrary.

FLOATING.

The excellent floating facilities in Finland impress one immediately. A network of rivers and lakes spreads all over the country, and when the rivers have been cleared of obstructions now hampering the floating in many sections, there will hardly be any part of the forest area of Finland that can not be exploited profitably by the sawmills. The many improvements made in the Finnish waterways up to the present time have not only had a direct bearing on the supply of logs at the sawmills, but have also enhanced many fold the value of timberlands which formerly were inaccessible.

The combined length of all the Finnish rivers suitable for floating aggregates 6,000 to 7,000 miles, and before the war an average of 30,000,000 to 40,000,000 logs were floated annually in these rivers. It is estimated that a land area of about 116,000 square miles, which is about 80 per cent of the total area of the country, is adjacent to these floating rivers.

The fall in the Finnish Rivers is less than that in the Scandinavian rivers. The fall in the Kymmene River is, on an average, 3¼ feet per mile, in the Vuoksen River approximately 2½ feet per mile, and in the Kumo about 2¼ feet per mile. In the rivers of Sweden the fall averages between 5 and 10 feet per mile, and in the rivers of Norway the fall may be as high as 50 feet per mile. The large rivers in northern Russia have considerably less fall than the Finnish rivers. For instance, the Petschora River has a fall of only one-half foot per mile.

The Finnish rivers have a great many waterfalls, generally from 5 to 6 feet high, and these offer obstruction to the floating of timber. The great number of lakes in Finland exercise an important influence on the floating of timber, because they regulate the water supply. The rivers in the coastal district pass through very few lakes and are therefore not so favorable for floating as the river systems in the interior and in the north.

As the Finnish rivers do not generally have very deep river beds inundations frequently occur during the spring flood and it is very difficult to prevent the logs from becoming scattered. While in Sweden and Norway there are two spring floods with a few weeks interval between them, there are only two rivers in Finland subject to these conditions—the Kemi and the Tornea Rivers. The snow melts first at the mouth of the river, allowing the ice to flow out before the second melting period sets in. This is of great importance to the floating of timber. Some weeks later the snow in the mountainous regions at the source of the river melts and a new flood starts. By that time the lower course of the river is practically clear of obstacles.

In northern Finland the floating period is very short, because the rivers in that part of the country do not run through such large lakes capable of retaining the water as are found in southern Finland. However, the lakes are not always of an advantage in the floating of timber. While the current in the rivers carries the logs without any mechanical assistance, the logs must be towed across the lakes, and at times the towing is very expensive, for the winds may scatter the rafts and cause a considerable loss.

Although timber has been floated in Finland for centuries, it was not until experts from Norway introduced Norwegian floating methods and systems, about 40 or 50 years ago, that the floating facilities of Finland were extensively developed and systematic floating was undertaken. Prior to that time floating was carried on by each sawmill individually and no efforts had been made to float logs jointly. When one sawmill company had finished the floating of its logs in one district, the company would often destroy all improvements which it had made in the waterways so that they could not be used by its competitors. It is evident that such methods produce a heavy cost of floating.

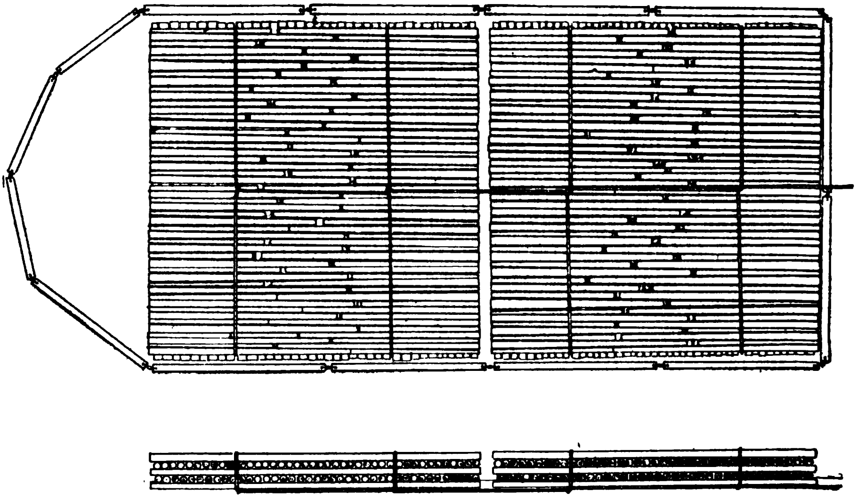

FIG. 12.—Construction of log raft for transportation across lakes.

During the last few decades floating has undergone a radical change and is now done along the same lines as in Norway and Sweden. Floating is usually done for mutual account through floating associations, the members of which are log owners interested in the floating of logs in the same river. This system applies to most of the principal floating rivers in Finland, where such floating for joint account is made compulsory by law. Sometimes the floating is undertaken by individual log owners, but it is practically confined to the minor tributaries of the principal rivers. Every year, however, the floating associations take in more and more of these tributaries. The floating associations pay all expenses in connection with the floating, such as wages, indemnity for damage, improvements, etc., and divide the cost pro rata among the log owners. The first association of this kind was started in the Kymmene River in 1873.

In the floating operations about 65,000 men are normally employed. However, a large percentage of these men are engaged in logging operations during the wintertime.

Both the Government and private enterprises have spent large amounts of money to improve the waterways and make them suitable for floating. Among the principal works of this character is a canal constructed by the Government in the Ulea River system costing in excess of $100,000.

CONNECTIONS BETWEEN RIVER SYSTEMS.

In several parts of Finland there have been constructed log-transportation devices whereby logs from one water system can be hauled overland or taken through canals into another water system. Some of the principal transports of this nature are in southeastern Finland, connecting the Saima River system with the Kymmene River system. A log elevator on the Saima, with a capacity of about 1,200 logs per hour, is operated about four months of the year. The logs are then taken into a canal and floated into the Kymmene River system.

In other parts of the country special railroads have been constructed for the transportation of sawlogs from one river system to another. One of the latest transports of this kind is being constructed in eastern Finland, by which logs from large areas of timberland on Russian territory can be transferred across a plateau to the rivers running into Finnish territory and taken down to the mills on Ladoga Lake. The cost of transporting logs in this way from one river system to another has been, on an average, from one-half cent to 1¼ cents per log.

In certain sections of northeastern Finland there are large areas of timberlands located on the eastern slope of the mountains. The logs from these areas are taken down the floating rivers to the Russian mills on the White Sea. Plans are under consideration for log-transportation devices that will permit these areas to be logged by the Finnish mills on the Bay of Bothnia.

The canals connecting the inland lakes and rivers with the ocean also play an important part in the logging operations. In 1913 about 70,000,000 cubic feet of sawlogs, timber, props, etc., and 30,000,000 cubic feet of firewood were transported through the canals of the country. In 1914 the corresponding figures were 44,000,000 cubic feet of logs, timber, props, etc., and 25,000,000 cubic feet of firewood. Most of this material was taken through the Saima Canal.

Considerable coastal rafting of logs is carried on in Finland. Logs are taken from Aland Island to the mainland and also from one coast district to another. Coastal rafting on short distances generally costs about 1 cent per log under normal conditions. Among the more important operations of this kind is the floating of logs from northern Finland to southeastern Finland, a distance of approximately 400 miles. The rafts are constructed in the same way as the cigar-shaped rafts on the Pacific coast of the United States, and each raft contains from 7,000 to 8,000 logs of about 20 cubic feet each, averaging about 160,000 cubic feet to the raft. The time required to tow these rafts varies from one to four weeks, depending upon weather conditions. One company that has a concession covering about 600,000 trees in the State forests in northern Finland rafts the logs in this way.

The time required for floating of logs in the rivers varies and may take only one season or as much as three seasons. Floating extending through three seasons is rare and the logs naturally depreciate considerably in quality during such long periods. The average time required in the principal Finnish rivers is two seasons. The percentage of sunken logs varies from 1½ to 3 per cent, the average being about 2 per cent.

Pine and spruce are the chief species floated, but birch is also floated to some extent, although it offers difficulties on account of its heavier weight. Recently an experiment was made in one of the principal rivers in floating birch cut into short lengths of about 3½ feet and 35,000 cubic feet of such stock was floated a distance of about 50 miles. The cost was about $0.003 per cubic foot. The quantity of sunken logs was only about 3½ per cent, which is considered very favorable.

PRINCIPAL FLOATING RIVERS.

The following information has been compiled regarding some of the principal floating rivers, where floating is conducted by associations:

KEMI RIVER.

The Kemi is the principal floating river in northern Finland. In this river the cost of floating is regulated according to the length of the logs. In computing the cost a log 23 feet up to 33 feet in length is considered a standard log and logs of other lengths are computed as follows: Logs 23 feet long and smaller, equal to one-half a standard log; 23 to 33 feet, one standard log; 33 to 42½ feet, two standard logs; 42½ to 49 feet, three standard logs; 49 feet and over, six standard logs. It is seen that the longer the log lengths the more expensive is the cost of floating. In this river the longest log length is practically 32 feet.

Log lengths have been constantly decreasing during late years, as is shown by the increasing percentage of logs with lengths 23 feet and less, which is as follows: 1911 and 1912, 64 per cent; 1913, 74 per cent; 1914, 75 per cent; 1915, 74 per cent; 1916, 70 per cent.

Floating in this river requires two years on an average. It usually starts about the middle of June and stops at the end of September. The following table gives number of logs floated and the maximum cost of floating in the Kemi River:

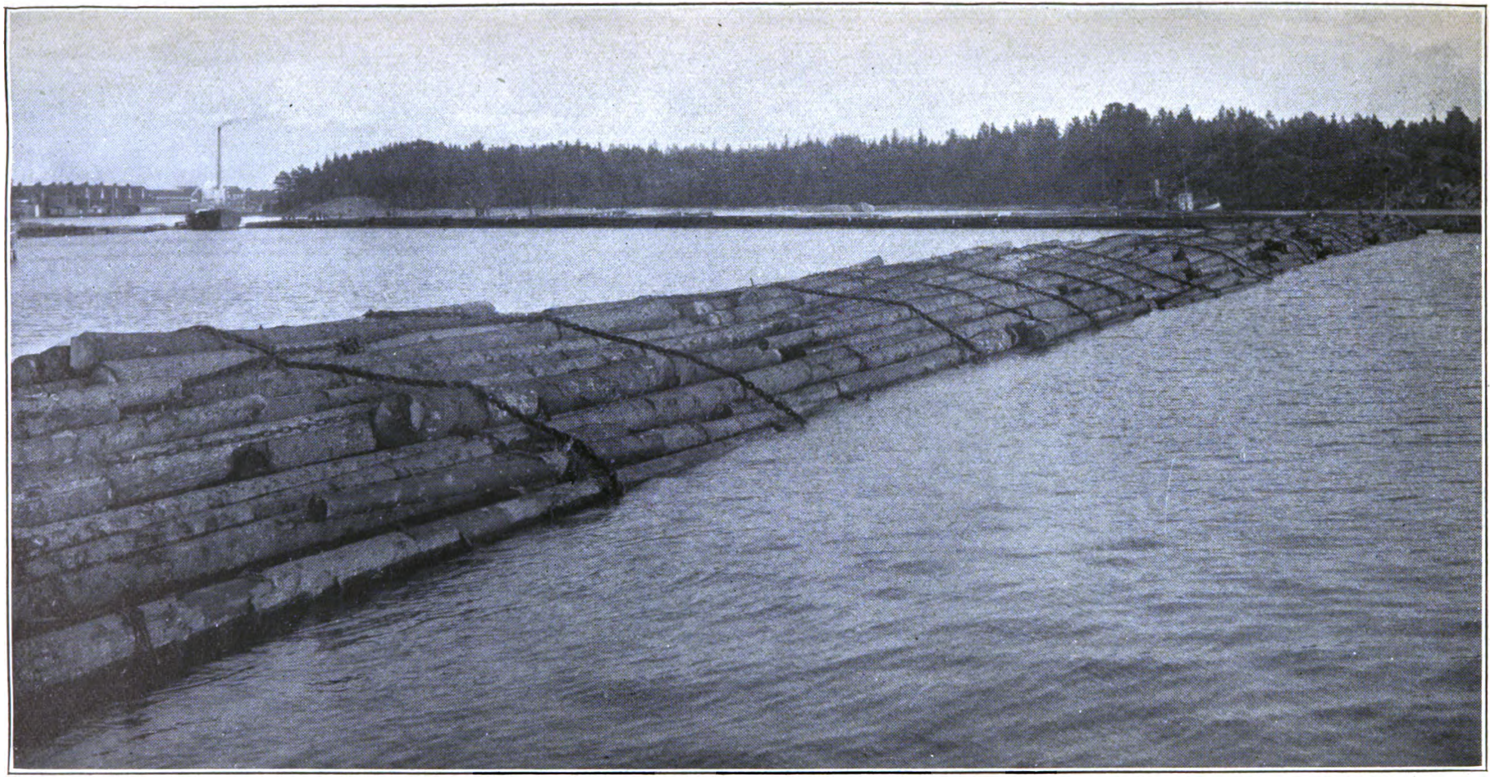

FIG. 13.—OCEAN RAFTING OF LOGS FROM NORTHERN FINLAND.

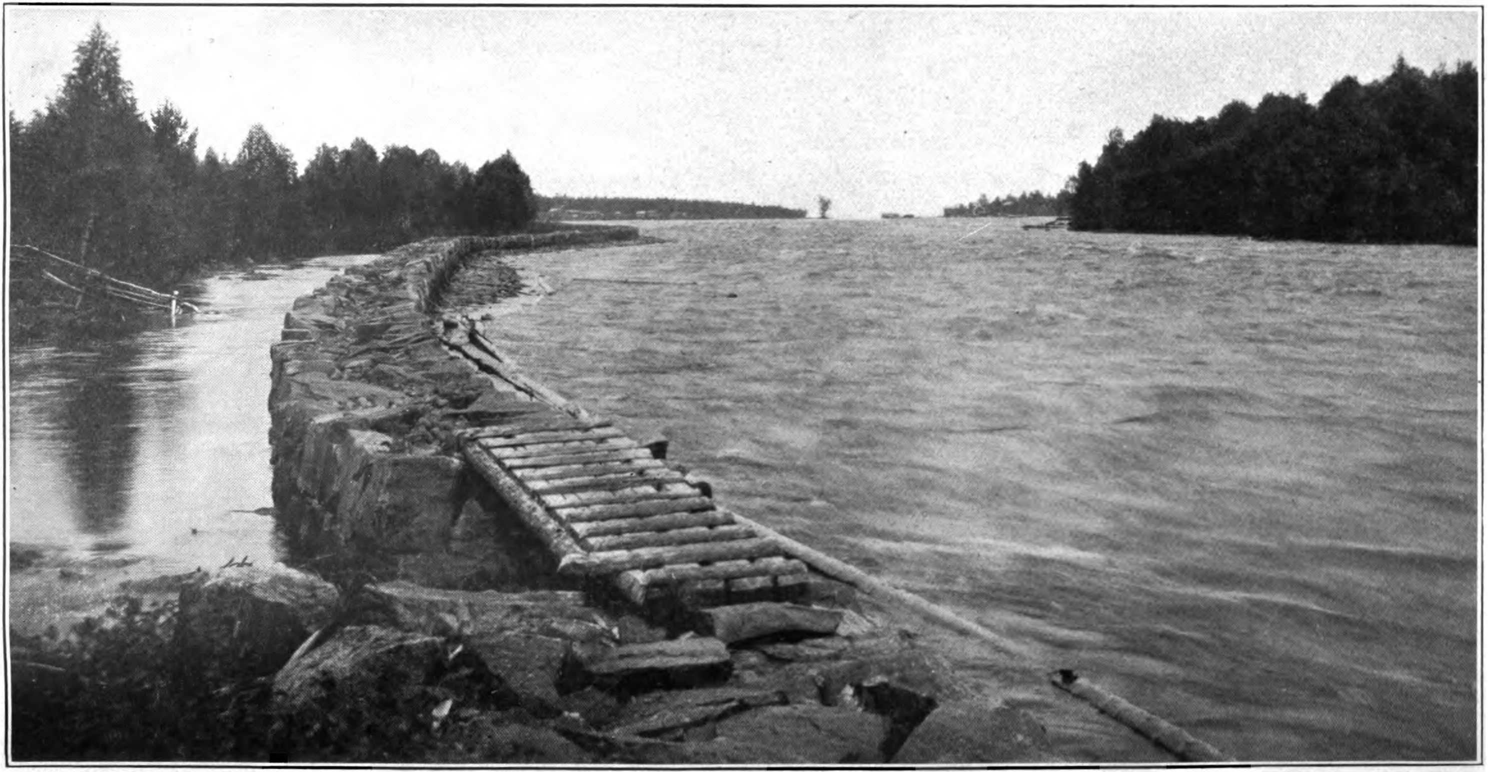

FIG. 14.—TYPICAL FLOATING RIVER IN FINLAND, SHOWING STONE WALL (BUTTRESS) AND BOOMS.

Years.	Number of logs.	Cost per log.	Years.	Number of logs.	Cost per log.
		Cents.			*Cents.*
1911	2,100,000	9.2	1914	2,100,000	10.5
1912	2,200,000	10.4	1915	1,000,000	12.2
1913	1,800,000	12.0	1916	1,800,000	12.2

The above costs cover the distance of approximately 140 miles from Kemijarven Luusua to the mouth of the river. The river is divided into sections and a stipulated charge is made for floating in each section.

KUMO RIVER.

The Kumo River, emptying into the Bay of Bothnia at Bjorneborg, is the principal floating river in that part of the country. Approximately 2,500,000 to 3,000,000 logs are floated annually during normal years. The cost of floating is calculated on a standard log length of 14¾ to 31 feet, as follows: Log lengths 14¾ feet and less, equal to three-fourths of a standard log; 14¾ to 31 feet, one standard log; 31 to 39⅓ feet, one and one-half logs; 39⅓ to 46 feet, two standard logs; 46 to 52⅓ feet, four standard logs.

The cost of floating, per standard log, from Tammerfors to Bjorneborg, a distance of about 94 miles, has been as follows during 10 years:

	Cents.		Cents.
1905	5.9	1910	5.3
1906	5.9	1911	4.6
1907	5.8	1912	5.1
1908	6.9	1913	5.1
1909	5.7	1914	5.0

The cost of floating per mile in 1914 would thus be five one-hundredths cent per log. The detailed cost per log was as follows:

	Cents.
Wages and supervision	1.3
Towing across lakes (about 30 miles)	.5
Damages	.3
Sorting of logs	.5
Depreciation of material and machinery	.2
Repairs, etc	1.4
Administration, interest, etc	.8
Total	5.0

The maximum distance which logs may be floated in this river system is 300 miles. Beyond the Bjorneborg-Tammerfors district the floating is carried on by each mill individually. In 1914 the cost of floating logs the maximum distance in this river system was 21 cents per log. The maximum length of logs is 34 feet and the shortest length 15 feet. The floating is generally completed in one year.

In the interior eastern district are two rivers, Pielisjoki and Koitajoki, which belong to the Saima water system. These rivers form only a part of a large river system where floating is conducted both by associations and by individuals, but a study of the cost of floating in these two rivers is believed to be representative for the Saima water system.

Years.	Pielisjoki River.		Koitajoki River.	
	Logs.	Cost per log.	Logs.	Cost per log.
		Cents.		*Cents.*
1914	2,500,000	2.2	1,100,000	3.0
1915	2,100,000	2.7	700,000	3.6
1916	1,700,000	4.3	600,000	4.8
1917	1,100,000	10.9	200,000	14.0
1918	1,500,000	18.6	600,000	22.3

The cost of floating is based upon the log lengths and the following schedule is followed: Logs up to 18 feet long, equal to seven-tenths of a standard log; 18 to 36 feet, 1 standard log; 36 to 42½ feet, 2½ standard logs.

KYMMENE RIVER.

The Kymmene River is by far the principal floating river in Finland. Through canals and use of log-transportation devices, this river system now embraces practically the whole of southern and eastern Finland, with the exception of the western and southwestern coastal regions.

Floating in the Kymmene River generally starts in May or June and ends in October. The following quantities have been floated during recent years:

	Logs.		Logs.
1912	6,900,000	1916	4,700,000
1913	7,000,000	1917	2,600,000
1914	5,600,000	1918	2,800,000
1915	4,100,000		

In this river system there are a great many lakes across which the logs must be towed at heavy expense. However, the improvements made in this river and the large number of logs annually floated largely reduce the cost per log.

In the floating district from Rautalampi to the mouth of the Kymmene River, which is 337 miles long, the cost of floating per log was as follows:

	Cents.		Cents.
1912	11.7	1916	15.6
1913	10.9	1917	37.4
1914	11.7	1918	57.7
1915	14.2		

The percentage of logs remaining in the river and not brought to their destination before the end of the floating season in recent years is illustrative of the unfavorable labor conditions during the latter part of the war: 1913, 1.2 per cent; 1914, 7.9 per cent; 1915, 7.7 per cent, 1916, 5.6 per cent; 1917, 47.6 per cent; 1918, 27.8 per cent.

The Kymmene River system is the best regulated in Finland and the floating is very well organized.

LABOR AND WAGES IN FLOATING.

The average wages paid men engaged in floating before the war was about 58 cents per day. Monthly wages varied from $14 to $17. During 1918-19 the wages were about 15 to 25 marks ($2.90 to $4.83 at par value) per day. Before the war foremen received about $23 to $38 per month and their pay during 1918-19 was about 390 to 450 marks ($75.25 to $86.85) per month. The floating of logs is very dangerous and hard work. Little has been done to provide housing accommodations for this class of laborers.

The future development of floating operations in Finland will be through further improvement of the waterways and conservation of the water during the spring flood. If the water flow could be regulated, the floating season would be extended, and in many cases this would greatly reduce the time required for the transportation of logs to mill. It is evident that such improvements would not only effect a saving of expenses but would also prevent deterioration of the logs. Logs remaining in the water for two or three years often discolor seriously.

LUMBER MANUFACTURE.

SAWMILLS.

Although the lumber industry in Finland may be traced back several hundred years, it was not until about 60 years ago that the sawmill industry was developed on a large scale. Prior to this time only small quantities of lumber and forest products were exported. Hand-sawn lumber, sawlogs, and heavy timbers constituted the principal items produced. The old sawmills were driven by water wheels and were usually located in the interior. The lumber had to be hauled long distances to the nearest port at a very heavy expense.

Prior to 1861 the sawmill industry was subject to many restrictions. The operation of steam sawmills was even prohibited at one time, because it was feared that the forests would be cut out. The last restriction on the sawmill industry was removed in 1861, and since that time the Finnish lumber industry has developed rapidly.

The first steam sawmill was built in 1857 in Bjorneborg, on the southwest coast. As a consequence of the large demand for lumber and the increased prices from 1870 to 1880, after the Franco-Prussian war, a number of steam sawmills were built. The development of the sawmill industry since 1885 is seen from the following table:

Years.	Number of mills.	Number of logs sawed.	Value of production.	Years.	Number of mills.	Number of logs sawed.	Value of production.
1885	244	6, 530, 000	$4, 236, 000	1906	597	30, 240, 000	$18, 546, 000
1890	341	11, 340, 000	6, 545, 000	1907	611	31, 990, 000	19, 565, 000
1895	327	14, 630, 000	7, 850, 000	1908	591	28, 340, 000	16, 929, 000
1899	570	21, 100, 000	12, 903, 000	1909	544	29, 160, 000	18, 747, 000
1900	604	25, 320, 000	15, 353, 000	1910	531	34, 490, 000	23, 808, 000
1901	637	22, 100, 000	12, 489, 000	1911	564	33, 460, 000	25, 465, 000
1902	644	22, 160, 000	12, 821, 000	1912	595	36, 030, 000	25, 127, 000
1903	684	26, 516, 000	15, 286, 000	1913	601	40, 630, 000	28, 684, 000
1904	527	26, 130, 000	15, 688, 000	1914	599	34, 290, 000	25, 115, 000
1905	598	24, 930, 000	15, 272, 000	1915	501	20, 680, 000	17, 537, 000

These figures are taken from official statistics and only mills operating on a commercial basis are taken into consideration. There are hundreds of other mills scattered all over the country, but these are small mills usually cutting only for the personal requirements of the owners and produce very little lumber for sale. While formerly there were a great many small mills cutting for export, the tendency recently has been to consolidate these mills. The larger mills have bought up many of these small ones in order to acquire their timber holdings, and this consolidation process is likely to develop further in the near future.

RECENT CHANGES IN OWNERSHIP.

During the war several of the larger mills in Finland changed hands. The Government purchased a majority of the stock in the

Aktiebolaget W. Gutzeit & Co., of Kotka, which was owned almost entirely by Norwegian interests. This company was started about 50 years ago and the par value of the stock was 2,500 marks ($482.50). The price paid by the Government is said to be 42,000 marks ($8,106). The company possesses about 1,200,000 acres of forest land, producing annually approximately 125,000,000 feet board measure of rough lumber and about 38,000,000 feet of planed lumber and box shooks. Numerous other activities in connection with the lumber industry and farming are also carried on by this company, which is probably the largest of its kind in Europe. It produces annually 30,000 tons of sulphite pulp, 30,000 tons of sulphate pulp, and 40,000 tons of mechanical pulp and cardboard.

Besides this property, the Government also purchased another large sawmill with pulp factories and timber holdings. In the future the Finnish Government will figure as a very important factor in the Finnish sawmill industry.

As an example of the increased value of forests and sawmill properties, it may be mentioned that a lumber company changed hands in 1917 at a price for the mill and timber lands of about $9,000,000. Ten years ago this property was valued at about 10 per cent of the price paid. According to official statistics, the total capital of all lumber and pulp companies in 1907 each having a capital of $19,300 or over was $17,500,000. In 1912 the total capital of mills of this category was $28,600,000, which represents an increase of 63 per cent in five years and shows clearly the tendency toward consolidation.

During the war several large contracts were made for the building of new sawmills and other factories to develop the forest resources in the southern and eastern parts of Finland. Some of these new mills will have an annual capacity of 50,000,000 to 60,000,000 feet.

LOCATION OF SAWMILLS.

Most of the large export mills are located on the southern and southwestern coast. There is also an important sawmill industry on the northern coast on the Bay of Bothnia. The most important districts are the Kotka, Bjorneborg, Kemi, and Uleaborg. In the interior of southern Finland, especially in the eastern section, there are a great many small mills that ship lumber by rail or by barges to the ports. In northern Finland there are few interior mills.

The mills are preferably located at the mouths of the principal floating rivers, because it is of great importance to the export mills to be as near the water front as possible. There are, however, a few large mills located in the interior that produce lumber for export, but such location is decidedly unfavorable, because the mills generally have to maintain two yards, one in the interior and one at the port of shipment. In only a few cases can lumber be shipped green and piled in the yards at the ports, thus avoiding the necessity of maintaining two yards. These mills can only export their products if conveniently located near railroads or navigable waterways. Lumber could not, before the war, be hauled more than 7 or 10 miles on highways, if a profit was to be made.

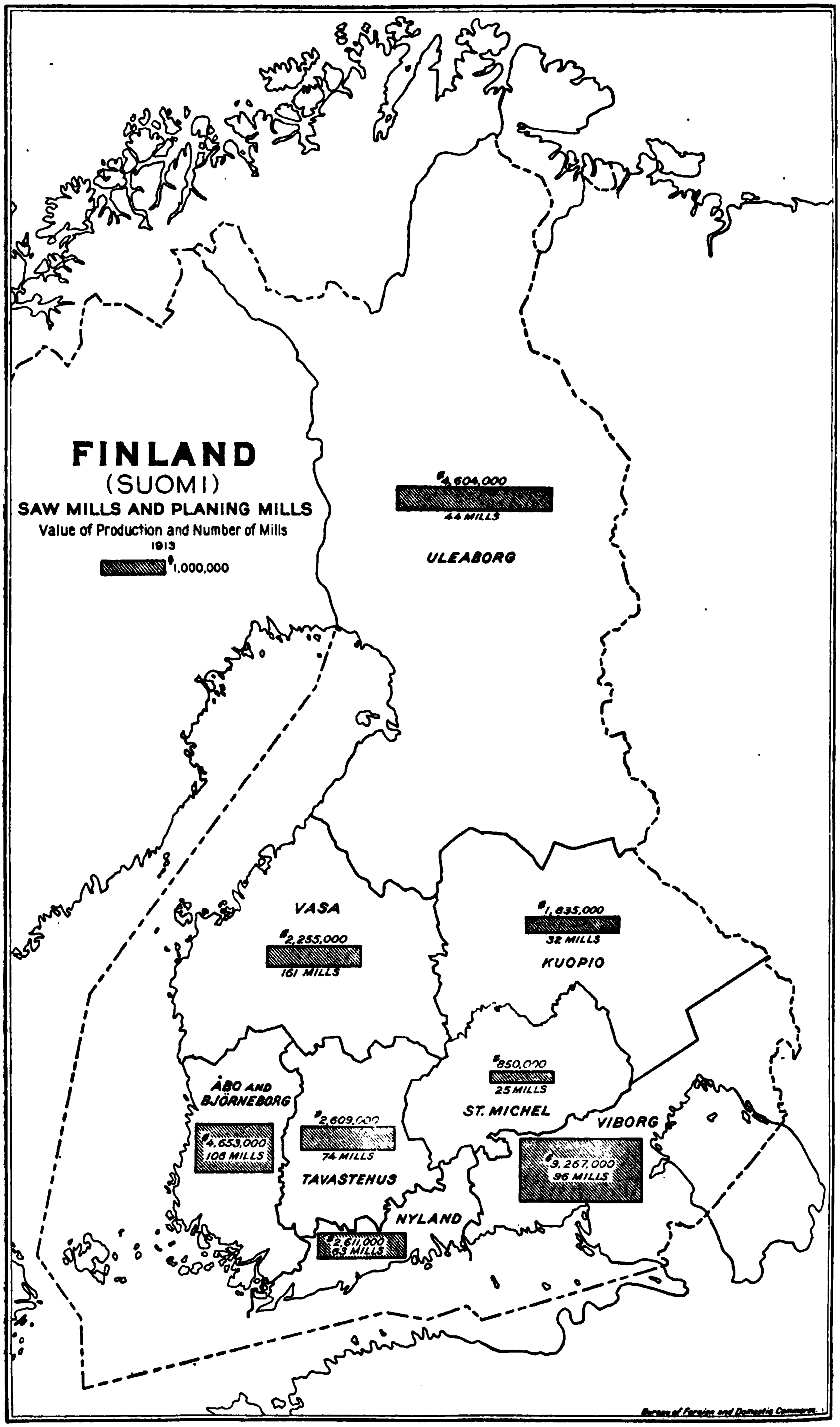

FIG. 15.—Number and value of annual production of saw mills and planing mills in 1913.

PRODUCTION OF THE MILLS.

The following table, compiled from official statistics of 1913, shows the number and production of saw and planing mills in each Province of Finland, no distinction being made in these statistics between sawmills and planing mills:

Provinces.	Mills.	Value of production.	Provinces.	Mills.	Value of production.
Nyland	63	$2,611,000	Kuopio	32	$1,835,000
Abo and Bjorneborg	106	4,653,000	Wasa	161	2,255,000
Tavastehus	74	2,609,000	Uleaborg	44	4,604,000
Viborg	96	9,267,000			
St. Michel	25	850,000	Total	601	28,684,000

CAPACITY AND OUTPUT.

Some time before the war statistics were compiled regarding the 152 largest sawmills in Finland. These mills were divided according to their annual production into the following groups:

Sawmills producing annually in excess of 12,000,000 feet board measure	26
Sawmills producing 8,000,000 to 12,000,000 feet board measure	22
Sawmills producing 4,000,000 to 8,000,000 feet board measure	52
Sawmills producing 2,000,000 to 4,000,000 feet board measure	52

The oldest of these mills was built in 1778.

Generally speaking, individual sawmills in Finland have a larger capacity that those in Scandinavia, because the forest area per mill is larger in Finland and the Finnish mills usually are in possession of extensive timber holdings. The average capacity of large export mills in Finland is probably around 20,000,000 board feet per year. The largest sawmill company in Finland has an annual output of about 160,000,000 board feet of rough and planed lumber, but this output is the production of a number of mills. There are several sawmills having an output of 60,000,000 to 80,000,000 board feet per year. Some of the largest sawmills also operate pulp factories. There are only a few planing mills in Finland.

The box industry is growing, but it has been restricted so far to a few of the larger concerns that operate planing mills. The future of the planing and box industries is doubtful, as it depends upon the policy in regard to tariff on such manufactured stock in foreign countries. On the other hand, the mills realize that the by-product industries of the lumber business must be developed to a much larger extent in the future.

Not so very many years ago several mills burned their refuse because there was no other way to dispose of it. This, however, is now seldom done, since the sawmill waste can be turned into profit.

Before the war the sawmill business in Finland was not an exceptionally profitable one. The mills may have earned, on an average, from 6 to 8 per cent on their investments, but undoubtedly this profit could have been greatly increased if the mills had utilized the logs and the waste more carefully.

While the sawmill business in Sweden and Norway has probably reached its climax in regard to output, the Finnish lumber industry will likely continue to increase for several years, because the supply of raw material is abundant, particularly in northern Finland, where thousands of acres of valuable timberland have not yet been exploited.

STORAGE OF LOGS.

During the spring, summer, and autumn the logs are stored in log ponds, but in the winter other arrangements must be made, because the ponds freeze over. In the northern sawmill districts "hot ponds," similar to those in Sweden, are in use, the water being kept open by exhaust steam from the engines.

In the autumn the logs are piled on land by log elevators and these piles may at times contain hundreds of thousands of logs. During the winter a narrow canal in the pond about 10 feet wide is kept open and the logs are dumped into this canal and taken to the mill as needed. Before the war the average cost of storing of logs on land was about 1 to 1½ cents per log, but during the winter of 1918–19 it was 2 to 2¾ cents per log.

In some cases the logs are piled in 12 to 15 tiers and stored in the water under the ice.

Another system of log storing was seen in a few mills. One tier of logs is drawn halfway up on land and other logs are pulled up close on this first tier so that about one-quarter of the log lengths protrude out of the water. By placing tier after tier in this way a great saving in space is effected. The cost of this storing before the war was about 0.3 to 0.5 cent per log and in 1918–19 0.8 to 1 cent.

Spruce logs are separated from pine logs in the log pond. Spruce logs are sawed the year around, but pine logs are not sawed during July and August because pine lumber is likely to discolor during the summer months.

The logs are separated in the log pond according to top diameter. Some mills sort the logs on the half-inch top diameter, while other mills sort them on the inch diameter only. It is evident that if the logs are sorted on the half-inch top diameter, the mills are enabled to more closely utilize the logs by applying such sawing schedules as will give the largest percentage of lumber. Several mills in Sweden are sorting logs on the one-fourth inch diameter, but this is not practiced in Finland. The logs are hauled to the mill on bull chains similar to those described in the report on the Swedish lumber industry.[1]

EQUIPMENT OF SAWMILLS.

The Finnish sawmills are operated and equipped similar to the mills of Scandinavia, as a large number of the mills were originally started by Norwegians and Swedes. Until recently an important percentage of the lumber for export in Finland was produced by Norwegian and Swedish owned mills, but these mills were, to a great extent, taken over by Finnish capital during the war. At the present time the sawmill industry in Finland is almost entirely Finnish owned.

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[1] See Special Agents Series No. 195, Swedish Forests, Lumber Industry, and Lumber Export Trade, p. 107.

Most of the large mills are operated by steam power, but there are a few more modern plants operated by electricity. Quite a few old-fashioned sawmills driven by water wheels may be seen, but their importance in the lumber export trade is very small.

As the cost of both labor and raw material was very low until recently, the Finnish mills have been inclined to disregard the importance of labor-saving devices or machinery. A great many mills are equipped with obsolete machinery, because before the war it would not have been economical to make changes in favor of new types. Until the present time there has been almost a total lack of conveyors and other transportation appliances in the Finnish sawmills. Lumber and refuse have usually been carried around the mill by women earning from $0.20 to $0.40 per day. The work in the Finnish mills is therefore generally hard, because it requires a great deal of unnecessary heavy lifting and handling.

The gauge of the saw blades varies from 11 up to 17 and 18 British wire gauge in the best cases. Band saws are not in use in Finnish mills. The only type employed in export mills is the gang saw, and the statistics for 1915 give the total number of gangs in the Finnish mills at 808. The gang saws have an average capacity of about 14,000 to 16,000 feet in 10 hours. Circular head saws are used only in the interior portable mills and some other small mills.

These were the conditions before the war, but a radical change is taking place at the present time, when the cost of both labor and raw materials has increased very materially, and most of the larger plants are being modernized as fast as conditions allow.

The Finnish-built machines are very heavy in construction and their capacity is limited. The better class of mills are equipped with Swedish sawmill machinery, while in the planing mills Norwegian machinery seems to be in favor. During the war the many restrictions upon the importation and the exorbitant prices demanded for machinery made it difficult for the Finnish mills to make improvements in their plants and to construct new mills.

In a typical Finnish export mill with an annual production of about 20,000,000 board feet, working two shifts of nine hours each, the equipment would be about as follows:

5 gang saws, of which two are used for logs that have to pass twice through the saws and three gangs for logs that pass only once through the saws.
2 edgers.
1 circular saw for cutting staves.
1 trimmer for slabs and other refuse.
1 edger for staves.
1 trimmer for staves.
2 hogs.
5 electric trimmers on dock.

The crew in such a mill would consist of the following men and women:

Log pond:	
Log scaler	1
Log grader	1
Pond men	5
Man on bull chain	1
Total	8

The mill:	
Mill foreman	1
Head sawyers	5
Assistant sawyers	5
Edger men	2
Assistant edger men	2
Stave sawyer	1
Stave edger man	1

The mill—Continued.	
Stave trimmer	1
Women for slabs and refuse	2
Men transporting the refuse to hogs	4
Operators of hogs	4
Women roughly trimming lumber and slabs	2
Truck loaders	4
Truck pushers	4
Horse driver	1
Total	39
Yard, shipping, etc.:	
Yard and shipping foreman	1
Pilers	12
Roof layers	2
Tallyman and bookkeeper	1
Graders (during the shipping season)	13
Truck loaders	7
Women unloading trucks	5
Yard, shipping etc.—Continued.	
Women marking and checking lengths	5
Trimmers	5
Loaders on barges	5
Women removing split wood and refuse	5
Boys stenciling lumber	6
Clean-up men in yard and on dock	5
Watchmen	2
Chief engineer	1
Assistant engineer	1½
Firemen	1½
Filers	3
Oiler	1
Carpenter	1
Blacksmiths	2
Mechanics	2
Total	87
Total, entire plant	134

In the years before the war a standard export mill with an annual capacity of about 20,000,000 board feet, completely equipped with yards, docks, etc., would cost approximately $100,000. The common type of small sawmill, equipped with Finnish machinery, found in the interior districts would cost as follows:

Engine, 8 horsepower	$650
Mill construction	250
Machinery	150
Total	1,050

A larger type of small sawmill was estimated as follows:

Engine, 25 horsepower	$1,350
Mill construction	1,350
Gang saw	650
Edger	350
Trimmer	100
Conveyor for logs	350
Shafts, belts, etc	275
Total	4,425

SAWING SCHEDULES.

The Finnish sawing schedules are somewhat different from the Scandinavian schedules, and generally a smaller percentage of lumber is obtained from each log on account of the larger saw kerf, the less exact system of sorting logs, and the small amount of wane given the lumber. As representative of the better Finnish sawing schedules, the following table is given:

Top diameter of logs.	Number of pieces and thickness of lumber produced.	Dimensions.
5 inches	1 piece 2 inches, 4 pieces ¾ inch	2 by 4 and ¾ by 4 inches.
5½ inches	1 piece 2 inches, 4 pieces ¾ inch	2 by 4 (5) and ¾ by 4 (4½) inches.
6 inches	2 pieces 2 inches, 4 pieces ¾ inch	2 by 4 (5) and ¾ by 4 inches.
6½ inches	2 pieces 2 inches, 4 pieces ¾ inch	2 by 5 and ¾ by 4½ (4) inches.
7 inches	2 pieces 2 inches, 4 pieces ¾ inch	2 by 5 (6) and ¾ by 4½ (4) inches.
7½ inches	2 pieces 2 inches, 4 pieces ¾ inch	2 by 6 and ¾ by 5 (4½–4) inches.
8 inches	2 pieces 2 inches, 2 pieces 1 inch, 2 pieces ¾ inch.	2 by 7 (6), 1 by 4½ (5–4), and ¾ by 4 inches.
8½ inches	2 pieces 2½ inches, 4 pieces ¾ inch	2½ by 7 (6½–6) and ¾ by 5 (6–4) inches.
9 inches	2 pieces 2 inches, 2 pieces 1 inch, 4 pieces ¾ inch.	2 by 8 (7), 1 by 6 (5–5½), and ¾ by 5 (4) inches.
9½ inches	2 pieces 3 inches, 2 pieces 1 inch, 2 pieces ¾ inch.	3 by 7 (8), 1 by 5 (4–4½), and ¾ by 4 (4½) inches.
10 inches	2 pieces 2 inches, 4 pieces 1 inch, 2 pieces ¾ inch.	2 by 9 (8), 1 by 6 (7–4½–4), and ¾ by 4 inches.
10½ inches	2 pieces 2½ inches, 2 pieces 1 inch, 4 pieces ¾ inch.	2½ by 9 (8), 1 by 7 (6), and ¾ by 6 (5–4) inches.
11 inches	2 pieces 3 inches, 2 pieces 1 inch, 4 pieces ¾ inch.	3 by 9 (8), 1 by 7 (6), and ¾ by 5 (4) inches.
11½ inches	2 pieces 3 inches, 4 pieces 1 inch, 2 pieces ¾ inch.	3 by 9, 1 by 8 (7–6), and ¾ by 4½ (4) inches.
12 inches	2 pieces 2 inches, 2 pieces 1½ inches, 2 pieces 1 inch, 4 pieces ¾ inch.	2 by 11 (10), 1½ by 9, 1 by 7, and ¾ by 5 (4½–4) inches.
12½ inches	2 pieces 3 inches, 4 pieces 1 inch, 4 pieces ¾ inch.	3 by 11 (9), 1 by 9 (7–8), and ¾ by 4½ (5) inches.
13 inches	2 pieces 3 inches, 2 pieces 1½ inches, 4 pieces 1 inch.	3 by 11, 1½ by 9, and 1 by 7 (6–4) inches.

NOTE.—Logs 8½ inches and over in top diameter are passed twice through the gang saws. Logs less than 8½ inches in top diameter are passed only once through the saws.

Logs of a large top diameter generally produce a larger percentage of lumber than logs of small diameter, and short log lengths give a better sawing result than long lengths. The long log lengths cause more waste (slabs) on account of the taper of the log. The number of logs per thousand feet board measure of lumber produced may vary from 10 to 15 up to 35 or 38. The average number of logs per thousand board feet may be about 22 to 26. In southern Finland the number of logs per thousand feet is larger than in northern Finland, because northern Finland obtains a large supply of timber from practically untouched virgin forests.

To produce 1,000 board feet of lumber there is generally required from 120 to 140 cubic feet of raw material in standard mills. The contents of the logs are based on top diameter measurement. The average percentage of planks, battens, and boards obtained is from 60 to 69, while in some of the modernly equipped mills the percentage may be as high as 70. This percentage may vary considerably and is to a great extent dependent upon whether the logs are passed once or twice through the gang saws. In the better mills it is customary to pass all logs having a top diameter of 8 inches and less through the gang saws once and those having a diameter of 8½ inches or over twice. Two sawings are more expensive, but the saving in material is very considerable. As the Finnish mills generally produce square-edged lumber, this sawing system should be particularly adapted to Finnish conditions.

In the past it has been contended by foreign competitors that the Finnish mills have often been too willing to comply with the importers' requirements in the way of sawing to any dimension requested, thereby often failing to give due regard to obtaining the largest quantity of lumber from each log, and have also failed to obtain such dimensions as yield the best profit.

Some inefficiently operated mills saw large quantities of boards. It is true that better prices are generally obtained for boards than for planks and battens, but the handling of such stock and the increased waste in raw material rarely justify the sawing of boards when planks and battens can be produced. For instance, some of the Finnish mills will turn out one-half inch boards, while orders for such dimensions are usually refused by the better class of mills, for the reason that the extra prices paid for such stock do not generally make up for the increased cost of the manufacture and waste.

The better class of mills always endeavor to cut through the center of the log, but many mills pay very little attention to this important matter. Lumber having the center of the log "boxed" is liable to show splits and shakes during the seasoning and give reason for complaint. Lumber cut from top logs may, however, be cut with the center "boxed." The Finnish lumbermen are very conservative and it is difficult for them to make changes in the methods followed for years.

WANEY LUMBER.

Although Finnish lumber is seldom suitable for the better class of joinery and furniture, it is well adapted for construction lumber. It is evident that ordinary construction lumber in most cases is just as useful if it contains a reasonable amount of wane. Norwegian lumber exporters first started to cut waney stock and the customers abroad soon became used to this material. The Swedish exporters followed and an attempt was made in Finland by a few concerns, but the other mills did not follow the example and the attempt to increase the amount of wane permissible in the Finnish grades of lumber had to be given up, at least by mills not willing to accept a lower price for their stock. A small amount of wane is usually allowed in all grades of Finnish lumber, and a few firms cut with a larger amount of wane than others, but receive lower prices for their products. These firms contend that the small discount at which their waney lumber is sold does not effect the profits realized on the operations, because the saving in material by cutting waney lumber amply makes up for the lesser selling price.

There are some extremely careful mills that have the bark on the wane removed by a knife before shipment is made. They claim that while the wane actually becomes larger in this way, it is not so conspicuous when the bark is removed and that a great many customers pay the greatest attention to the good appearance of the lumber.

DIMENSIONS OF SAWN LUMBER.

Finnish lumber is always cut with a certain excess to provide for drying. The excess allowed in years past has been larger than strictly necessary. Economy in this matter has been started by many mills, and the following schedule covering the excess given green lumber of different dimensions is in general use in the best-managed mills: For thickness of $1\frac{1}{2}$ inches and less, $\frac{4}{64}$ of an inch; 2 to $2\frac{1}{2}$ inches, $\frac{5}{64}$ of an inch; 3 inches, $\frac{6}{64}$ of an inch; 4 inches, $\frac{8}{64}$ of an inch. For width measurements less than 8 inches the excess allowed is $\frac{10}{64}$ of an inch; 9 inches, $\frac{13}{64}$ of an inch; 12 inches, $\frac{15}{64}$ of an inch.

Lumber cut from quick-growing timber is likely to shrink a great deal more than the average; lumber of this kind may be a trifle scant, especially in wide sizes, if an extra excess is not given such stock. Finnish lumber is seldom more than one-eighth of an inch scant in width.

The thickness and width of Finnish lumber is always cut to English measurement. Cutting to metric measurement is so rare that it may be entirely left out of consideration, although the set-works of the machines may easily be adjusted for such cutting. The following schedule represents the customary dimensions cut by most of the larger export mills:

Thickness.	Width.	Thickness.	Width.	Thickness.	Width.
Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
4	[a] 11	2	9	1¼	[b] 4
	10		[a] 8		[a] 3½
	[b] 9		[a] 7		[a] 3
	[a] 8		[a] 6	1	11
	[a] 7		[a] 5½		10
	[a] 6		[a] 5		[a] 9
	5		[b] 4½		[a] 8
3	[a] 11		[b] 4		[b] 7
	10		[b] 3½		[b] 6
	[b] 9		[b] 3		[b] 5½
	[a] 8½	1½	11		[b] 5
	[a] 8		[a] 10		[b] 4½
	[a] 7		[a] 9		[b] 4
	[a] 6		[a] 8		[a] 3½
	5½		[b] 7		[a] 3
	5		[b] 6	¾	7
	[a] 4½		[a] 5½		6
	[a] 4		[a] 5		5½
2½	11		[a] 4½		[a] 5
	10		[a] 4		[a] 4½
	9		3½		[b] 4
	8		3		[a] 3½
	[b] 7	1¼	11		[a] 3
	[b] 6½		10	⅝	7
	[b] 6		[a] 9		[a] 6
	5½		[a] 8		[a] 5½
	[a] 5		[b] 7		[a] 5
	4½		[b] 6		[a] 4½
	[a] 4		[b] 5½		[b] 4
	3		[b] 5		[a] 3½
			[b] 4½		[b] 3

[a] Usually in demand. [b] Always in demand.

Five-eighths-inch boards are not always stock sizes, because very small quantities are produced, and a mill may permit such stock to accumulate from year to year and place it on the market when sufficient quantities have accumulated. There are also ½, ⅞, 1⅛ inch thicknesses, but such dimensions are not considered as regular stock sizes. Of spruce there are fewer dimensions than of pine. A few concerns may produce limited quantities of stock 12 inches wide.

STOCKS CARRIED BY MILLS.

The pine stock of a typical mill in southern Finland would be about as follows:

Sizes.	Quantity.	Proportion of total.
	1,000 bd. feet.	*Per cent.*
4 by 11 inches	2	
3 by 11 inches	20	
	22	0.1
3 by 10 inches	16	.1
4 by 9 inches	396	
3 by 9 inches	937	
2 by 9 inches	24	
1½ by 9 inches	26	
1¼ by 9 inches	99	
1 by 9 inches	51	
	1,533	5.0
3 by 8½ inches	343	1.2
4 by 8 inches	44	
3 by 8 inches	297	
2½ by 8 inches	117	
2 by 8 inches	53	
1½ by 8 inches	10	
1¼ by 8 inches	101	
1 by 8 inches	32	
	654	2.3
4 by 7 inches	103	
3 by 7 inches	311	
2½ by 7 inches	3,776	
2 by 7 inches	487	
1½ by 7 inches	34	
1¼ by 7 inches	149	
1 by 7 inches	38	
	4,898	16.0
2½ by 6½ inches	2,441	
2 by 6½ inches	40	
	2,481	8.1
4 by 6 inches	18	
3 by 6 inches	103	
2½ by 6 inches	2,768	
2 by 6 inches	1,089	
1½ by 6 inches	186	
1¼ by 6 inches	127	
1 by 6 inches	515	
⅞ by 6 inches	8	
¾ by 6 inches	236	
	5,050	16.7
2½ by 5½ inches	449	
2 by 5½ inches	303	
1½ by 5½ inches	117	
1¼ by 5½ inches	81	
1 by 5½ inches	337	
⅞ by 5½ inches	14	
¾ by 5½ inches	182	
	1,483	4.9
4 by 5 inches	8	
3 by 5 inches	152	
2½ by 5 inches	83	
2 by 5 inches	1,192	
1½ by 5 inches	14	
1¼ by 5 inches	204	
1 by 5 inches	576	
⅞ by 5 inches	59	
¾ by 5 inches	370	
⅝ by 5 inches	113	
	2,771	9.0
4 by 4½ inches	14	
3 by 4½ inches	552	
2½ by 4½ inches	65	
2 by 4½ inches	1,544	
1½ by 4½ inches	117	
1¼ by 4½ inches	550	
1 by 4½ inches	382	
⅞ by 4½ inches	95	
¾ by 4½ inches	135	
	3,454	11.4
3 by 4 inches	673	
2½ by 4 inches	38	
2 by 4 inches	3,366	
1½ by 4 inches	93	
1¼ by 4 inches	933	
1 by 4 inches	1,049	
⅞ by 4 inches	147	
¾ by 4 inches	358	
⅝ by 4 inches	10	
	6,667	22.0
2 by 3½ inches	230	
¾ by 3½ inches	28	
	258	.9
3 by 3 inches	16	
2 by 3 inches	426	
1¼ by 3 inches	129	
1 by 3 inches	77	
¾ by 3 inches	34	
	682	2.3
Total stock	30,312	100.0

The above stock classified according to thickness is as follows:

	Per cent.
4 inches	1.9
3 inches	11.3
2½ inches	32.1
2 inches	28.9
1½ inches	2.0
1¼ inches	7.8
1 inch	10.1
⅞ inch	1.1
¾ inch	4.4
⅝ inch	.4

The average width of the entire stock is $5\frac{19}{32}$ inches.

The spruce stock of a typical mill in southern Finland would be about as follows:

Sizes.	Quantity.	Proportion of total.	Sizes.	Quantity.	Proportion of total.
	1,000 bd. feet.	*Per cent.*		*1,000 bd. feet.*	*Per cent.*
4 by 9 inches	38		2½ by 5½ inches	59	
3 by 9 inches	248		2 by 5½ inches	44	
1½ by 9 inches	14		1½ by 5½ inches	2	
1 by 9 inches	4		1¼ by 5½ inches	93	
			1 by 5 inches	16	
	304	5.7			
				214	4.0
3 by 8½ inches	24	.5			
			2½ by 5 inches	79	
3 by 8 inches	16		2 by 5 inches	301	
2½ by 8 inches	55		1½ by 5 inches	2	
2 by 8 inches	36		1¼ by 5 inches	200	
1½ by 8 inches	18		1 by 5 inches	91	
	125	2.4		673	12.6
3 by 7 inches	14		2 by 4½ inches	279	
2½ by 7 inches	661		1½ by 4½ inches	73	
2 by 7 inches	67		1 by 4½ inches	26	
1½ by 7 inches	2				
1¼ by 7 inches	97			378	7.1
1 by 7 inches	10				
			2 by 4 inches	584	
	851	16.0	1½ by 4 inches	186	
			1 by 4 inches	77	
2½ by 6½ inches	596				
2 by 6½ inches	4			847	15.9
	600	11.3	2 by 3½ inches	2	.1
3 by 6 inches	2		2 by 3 inches	57	
2½ by 6 inches	509		1½ by 3 inches	18	
2 by 6 inches	453				
1½ by 6 inches	2			75	1.4
1¼ by 6 inches	133				
1 by 6 inches	123		Total stock	5,315	100.0
		23.0			
	1,222				

The spruce stock, classified according to thickness, is as follows:

	Per cent.		Per cent.
4 inches	0.7	1½ inches	0.2
3 inches	5.7	1¼ inches	15.6
2½ inches	36.9	1 inch	6.5
2 inches	34.4		

The average width of the spruce stock is $5\frac{13}{16}$ inches.

Generally speaking, the output of an export mill consists of about 85 per cent planks, battens, and boards, 12 per cent staves, laths, broom handles, and other similar stock, and 3 per cent firewood. These figures do not include split wood (½ to 5½ feet long). The quantity of short lumber varies more than anything else and it is impossible to give a definite statement in this regard. However, any surplus stock of short lumber is easily disposed of in the local markets. All contracts for export include a certain percentage of short lumber, usually from 3 to 5 per cent of the total shipment, and in this way the mills have been able to dispose of the most of such stock.

Lumber is not usually trimmed in the mill, except in a few cases where the mills cut for one market only, which enables them to have only one standard length measurement. There is no question but that the system of trimming the lumber when shipment is made is the better from any viewpoint, as it does away with a good deal of unnecessary handling of refuse in the mill and also enables the mill to trim to any dimension which will make the stock more easily salable. Furthermore, the appearance of the stock is better when trimmed immediately before the shipment is made, and the stencil or brand appears more clearly when the stock is trimmed immediately before the stencil is stamped on each piece.

CONSERVATION OF REFUSE.

From the sawmill refuse a great many specialties are manufactured, such as staves, laths, broom handles, slating battens, and to some extent box shooks.

Staves.—Staves are sawed to various dimensions according to the markets. Both pine and spruce are used for cement staves and the dimensions most in demand are as follows: ½ by 2, 2½, 3, 3½, 4, 4½, and 5 inches; lengths, 23, 26, 28, and 29 inches. Headings are cut to ½ by 2, 2½, up to and including 7 inches, and in lengths of 17, 34, 18, and 36 inches. Of stock 2 inches wide the quantity must generally not exceed 10 per cent of the total shipment.

Formerly Germany was in the market for special staves wider at the middle than at the ends (fuget staves), but this stock has not been supplied for some time. The staves must be dry, bright, free from rot, discoloration, and large loose knots, and must not have any wane. Staves are sold per Petrograd standard (165 cubic feet).

Slating battens.—Slating battens are used for roof construction, etc., and run in sizes ¾, ⅞, 1, and 1⅛ inches in thickness and 1, 1¼, 1½, up to 3 inches in width. They are sold by the Petrograd standard.

Laths.—The usual dimensions are 1 by 3/16, 1 by ¼, and 1⅛ by 3/16 inch, with lengths of 2½, 3, 3½, 4, and 4½ feet. Laths are graded into two qualities. First grade must be well sawn, bright, free from decay, and well seasoned. Second quality may have slight defects.

Broom handles.—Broom handles are put up in sizes of 1 by 1, 1⅛ by 1⅛, 1¼ by 1⅛, and 1¼ by 1¼ inches. If shipped to Germany they are cut in lengths of 1.10, 1.20, 1.30, 1.35, 1.40, and 1.80 meters. These broom handles are shipped in boxes.

Some mills also make charcoal, using all edgings and other refuse which can not be worked into other products, but the market for charcoal is not as good in Finland as in Sweden.

Sawmills located in districts where they can dispose of their refuse to pulp mills pass most of it through hogs and sell the chipped refuse to pulp mills. Most of the mills sell part of the refuse locally for firewood. Necessary fuel for the household is generally given to the laborers.

In southern Finland the opportunities for realizing a profit on the refuse is very good, because most of the pulp and paper mills are located in this part of the country. The following prices obtained for refuse and waste products in 1913–14 and 1918–19 are illustrative of the change in conditions in Finland:

Articles.	1913–14	1918–19
Refuse chipped for pulp mills........per cubic yard..	$0.15–$0.30	$0.80–$2.00
Sawdust........do....	.08	.50
Mill ends less than 6 inches long........do....	.50	2.50
Charcoal (sold by the hectoliter, equal to 2.84 bushels)........per hectoliter..	.12	.97
Wood tar (manufactured in the north and sold per barrel of 125 liters, equal to 132 quarts)........per barrel..	4.83	38.60

These prices for sawmill waste apply mainly to southern Finland, where market conditions are very good, and may be considerable higher than the average for the whole country. Sawmills located in districts where they can not profitably dispose of their refuse to the pulp mills have found it advantageous to generate electricity by using refuse as fuel. It is claimed that many companies have realized a larger profit by this procedure than by selling the refuse to the pulp mills. One company reports that while refuse sold to pulp mills commanded only about 17 cents per cubic yard before the war, 39 to 42 cents per cubic yard was realized when the electric power generated from this refuse was sold.

The supply of pulp wood is in all probability going to be somewhat decreased in the future, and pulp making will be increased, if the present high price of pulp and paper can be maintained. In order to carry out an increased production of pulp and paper, the pulp mills must to a great extent turn to the sawmills for raw material (sawmill waste) suitable for pulp making. In the future the sawmills of Finland will, therefore, aim at a closer utilization of their waste products.

SEASONING.

There are yards in Finland which surpass any other lumber yards in Europe in regard to size and careful handling of the lumber, but there are also a great many yards which show defective methods of piling and seasoning. These latter conditions apply mainly to medium and small sawmills, often operated by peasants in the interior. The standard export mills are generally careful to have the lumber properly seasoned. As Finland can not ship lumber during a period of two to five months of each year, as much as 50 per cent of the annual production must often be stored in the yards. These yards are, therefore, generally larger than found in other countries where better shipping conditions prevail. They are usually located at least 300 feet from the mill. This is done on account of the danger of fire and to comply with the regulations of the insurance companies.

In the largest and best-equipped yards automatic stackers and other mechanical devices for piling lumber are found, but as a general rule the lumber is piled by hand. A few yards are equipped with oil-burning locomotives for the transportation of lumber from the mill to the yard. Most of the better yards are equipped with a rail system.

Every piece of lumber that goes out of the mill is seasoned before it is shipped. This applies even to cull lumber. The system of piling is the same as used in Scandinavia. The time required for seasoning varies a great deal in the different parts of Finland, according to the climate and the season of the year. In the principal shipping districts of southern Finland pine lumber sawed during the winter may be shipped at the end of June. If sawed during May and early summer, the lumber may be shipping dry at the middle of July in favorable cases or at the beginning of August. If sawed during the late autumn, the lumber must lay over until the following spring or early summer. Spruce dries a great deal quicker than pine, and if such lumber is sawed during the autumn, it may be shipping dry at the middle of May of the following year. If sawed during the spring and summer, only six or seven weeks may be required for seasoning. In northern Finland the time required for seasoning is somewhat longer. If the lumber is destined for faraway countries, such as South Africa, special care is taken to have it perfectly dry and the time required for seasoning is somewhat longer. It must be noted that this extra care in seasoning is compensated by higher prices.

The piles are usually from 20 to 30 feet high, from 18 to 20 feet wide, and from 20 to 25 feet long, holding from 30,000 to 33,000 board feet of planks and battens and from 25,000 to 30,000 feet of boards. The base of the pile is from 2 to 4 feet from the ground, but in this particular a great deal of carelessness is shown by inefficient mills which pile lumber almost on the ground, with a consequent deterioration in quality. Space up to 6 inches between each piece of planks or the wider dimensions of battens is usually given in piling. In some yards special care is given to the piling of dimensions of which there is a limited output. It may require several months to complete such a pile and there is a danger of having the lumber damaged by rain during the time it is uncovered. Instead of leaving the unfinished piles exposed to the elements, several mills cover a half-finished pile with a roof and then start the other half. In this way the lumber is well protected. Only one dimension (width and thickness) is placed in each pile, but all lengths are mixed. Lumber is considered dry for shipping when it contains about 30 per cent moisture.

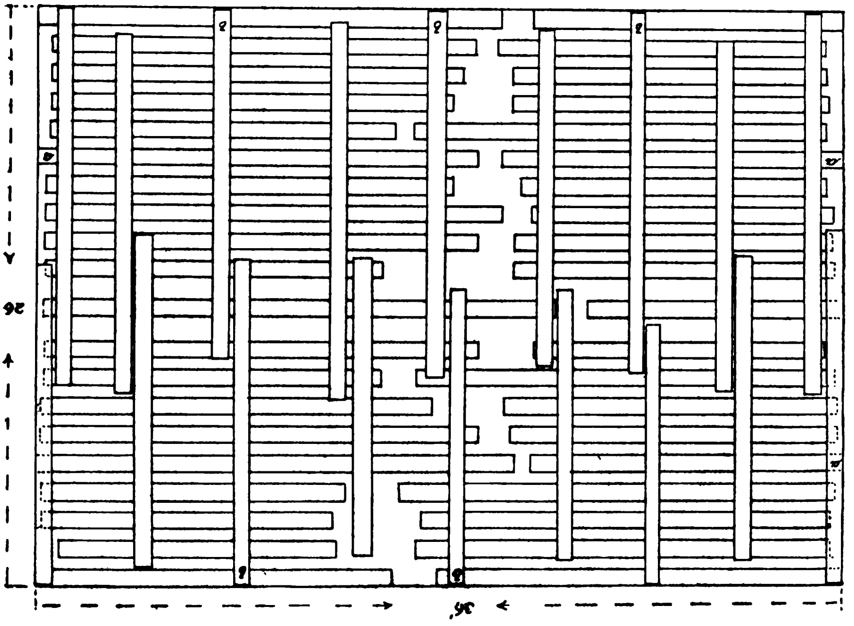

FIG. 16.—Piling system for lumber.

DRY KILNS.

A few of the larger sawmills in Finland have installed kilns and other mills are now contemplating the building of them. While in Sweden kilns have not been generally introduced on account of the high value placed on sawmill refuse, they have a particular chance of success in Finland, because the utilization of waste is not so close and the value of waste material is therefore correspondingly lower.

The type of kilns generally used is modeled after the American pattern and modified according to local conditions. It has been found that the sawmills that operate planing mills have been particularly benefited by kilns, because the stock for planing requires a moisture content of about 25 per cent and it would take an unduly long time to season such stock in the open air. Furthermore, by using kilns a great deal of yard space and handling of lumber is saved.

One type of kiln built some time before the war, with a capacity of about 20,000 feet per day, cost about $11,000. Timbers up to 9 by 9 inches are kiln dried in this kiln. The schedule for drying is as follows: 9 by 9 inch timbers, 10 to 14 days; 4 by 12 inch, 10 to 14 days; 3 by 9 inch, 6 to 8 days; 3 by 4 inch, 5 to 6 days. Instead of stacking lumber of the same dimensions on one car, it has been found in Filand that better results are obtained if various widths of lumber are mixed.

The cost of kiln drying in Finland has been given at about 30 to 50 cents per thousand feet, but the value of the fuel is very small and practically the only expense is for handling. The kiln-dried lumber is all piled under roof or in sheds.

The kiln is of the greatest value to the lumber exporters during the shipping season, because lumber can be cut while the ship is in port and turned out from the kiln before the balance of the cargo is on board. In other words, it enables the Finnish mills to carry smaller stocks of all dimensions and places them in a position to make quick deliveries. The customers abroad do not object to kiln-dried lumber and it seems that the kilns have a future in Finland. The kilns have usually been installed by Swedish concerns.

GRADING.

Before leaving the mill lumber is roughly graded, but the principal grading is done immediately before shipping. There are no standard grading rules for the entire country or for any particular district. Standardization of the grading rules has not been taken up by the sawmill association.

Every mill has its own established standards of grading, to which it adheres very closely, and the grades are the same year after year. Different mills in the same district do not grade in the same way. The explanation is that the mills generally have old-established connections that are familiar with the exporters' grading rules, and these rules may have been worked out to suit special markets or customers.

Finnish lumber is generally too knotty to allow grading into five or six different qualities. The percentage of clear lumber is usually so small that it does not pay even to separate such stock from the rest. Sap and flat or vertical grain is not taken into consideration, and very little attention is given to the number of annual rings per inch.

Finnish lumber is essentially a construction material and is not suitable for finishing purposes. If used for interior finish, furniture, etc., it must be painted, because the wood does not show any beautiful figuring and the large number of knots spoils the appearance.

Lumber for export is generally graded into two qualities, "unsorted grade" and "fifths," the latter being a better class of cull lumber. The inferior grade of cull lumber is seldom or never exported. The Finnish unsorted grade is somewhat different from the Swedish unsorted grade, because it allows a certain percentage of Swedish fifth grade, such as slightly discolored lumber and other minor defects contained in the better class of Swedish cull stock. It is safe to say that the Finnish grading rules are thus from 10 to 15 per cent less strict than the Swedish grading rules.

On the other hand, Finnish lumber usually has a smaller percentage of wane. Planks and boards contain less wane than the battens. The wane allowed in the unsorted grade of battens is equal to about one-fourth the thickness of the piece, if the wane occurs on two edges, and somewhat more if it is found on only one edge. The amount of wane permissible is often subject to special arrangements between the importer and exporter. Discolored lumber may in many cases be separated and a special grade made for it. Such lumber is branded as discolored stock.

A few mills having exceptionally good timber may grade their lumber into four or five different grades, and in such cases the grading rules are similar to the Swedish rules used in the lower gulf districts, but are less strict. As the percentage of clear lumber is very much smaller in Finland than in the lower gulf district, it is safe to assume that first quality Finnish stock is equal to second quality Swedish lower gulf classification. Only pine is graded in this way. Spruce is usually only separated into unsorted grade and better class of cull.

The grading of lumber is, in many cases, subject to special arrangements between buyer and seller. For instance, in France the importer may ask to have the unsorted grade classified into three qualities, first, second, and third, with an equal percentage of each quality. But this is not the general rule concerning shipments of lumber to France and is only a special arrangement made with certain importers.

The proportion of unsorted grade is generally from 75 to 80 per cent and disclored and better class of cull 20 to 25 per cent. It is doubtful whether it would pay to grade Finnish lumber into more than two grades, as the cost of handling and other expenses would possibly exceed the small increase in price that is obtained for stock graded into several qualities.

The tendency in Finland will be the same as it has been in Scandinavia, viz, to grade the lumber into two or three grades and to cut it with a larger percentage of wane.

EMPLOYEES IN SAWMILLS.

The number of employees in the Finnish sawmills (including planing mills) and the percentage the number bears in relation to the total number of employees in all industries are given in the following table from official statistics:

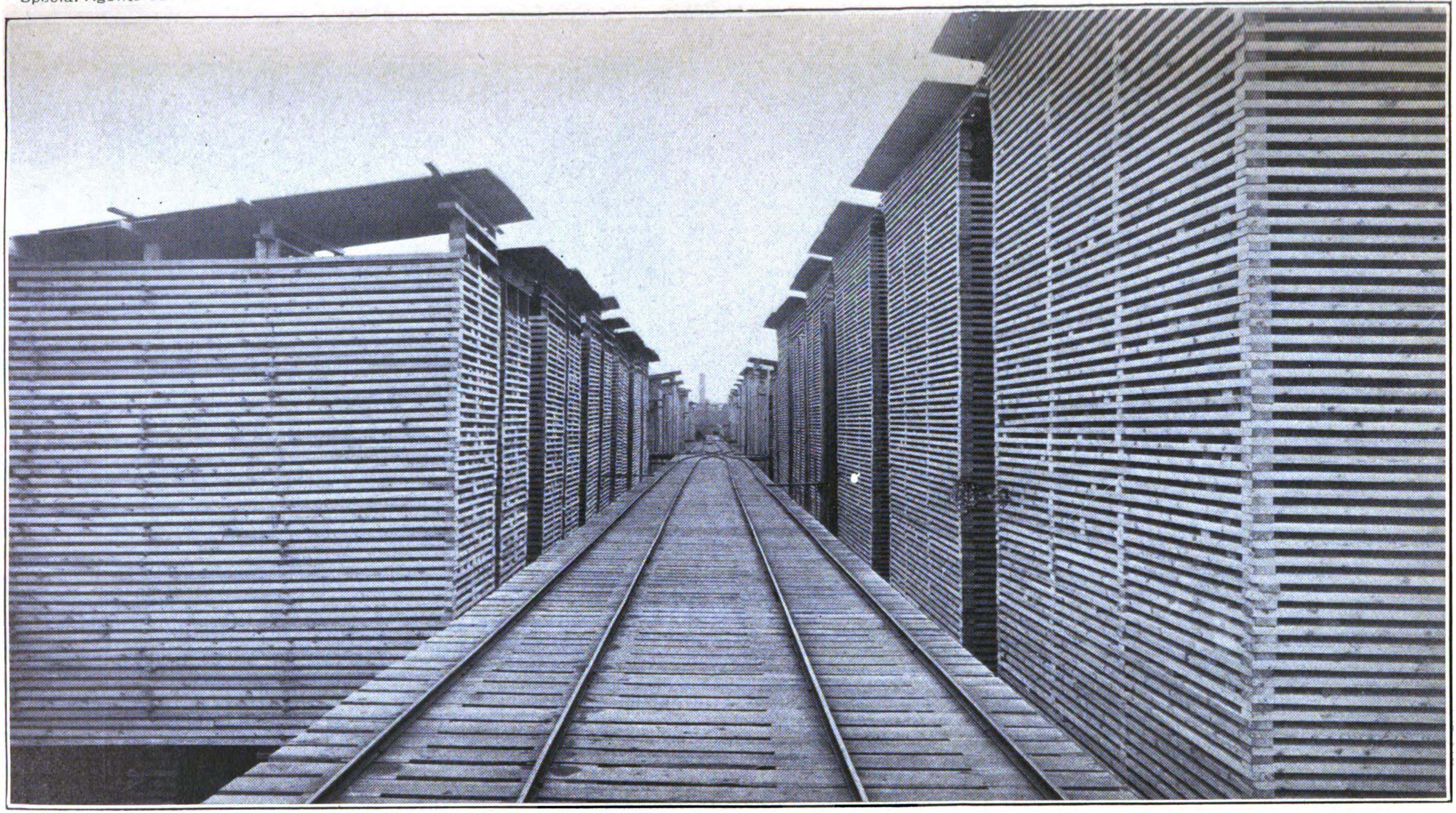

FIG. 17.—PILING SYSTEM IN MILL YARD.

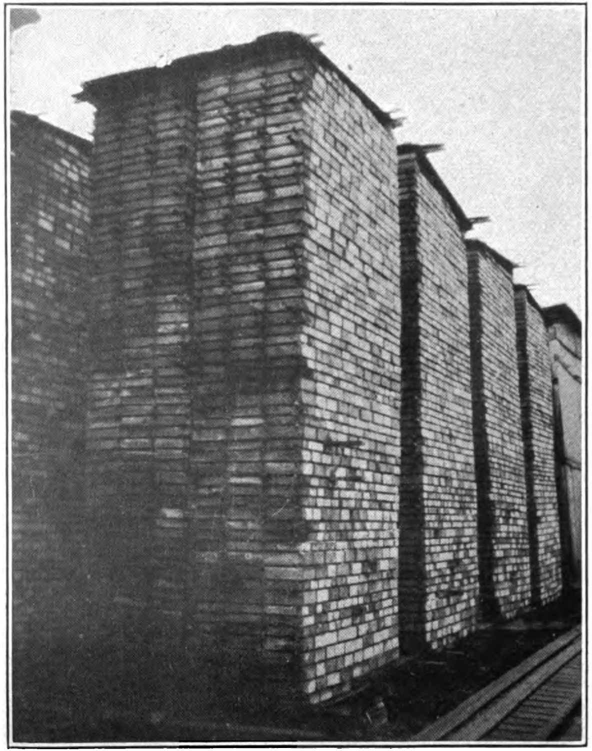

FIG. 18.—PILING OF MILL ENDS.

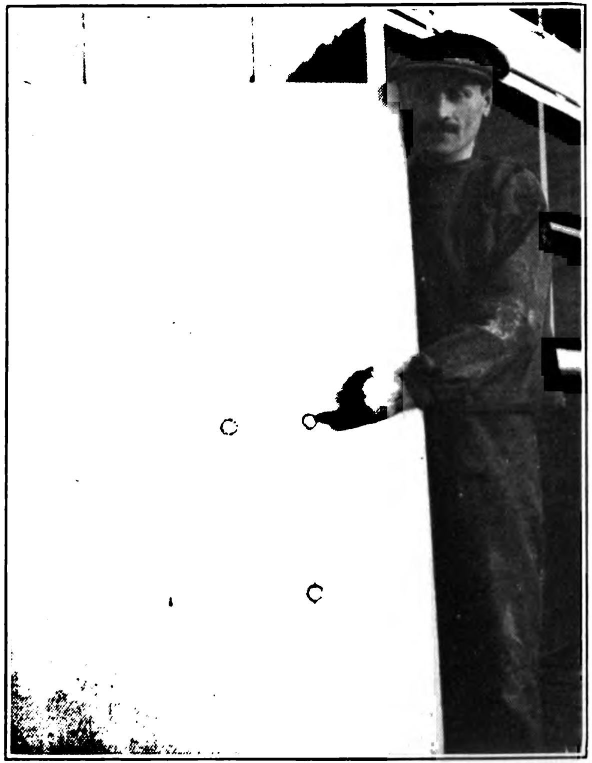

FIG. 19.—"MANUFACTURE" OF CLEAR LUMBER BY BORING OUT KNOTS AND INSERTING WOODEN PEGS IN THEIR PLACE.

Years.	Sawmill employees.	Per cent of all employees.	Years.	Sawmill employees.	Per cent of all employees.
1885	7,284	19.2	1906	23,772	20.8
1890	10,578	17.9	1907	25,821	19.1
1895	12,091	18.5	1908	23,945	18.9
1899	20,231	20.8	1909	22,705	25.6
1900	22,426	22.7	1910	23,585	25.4
1901	21,937	22.9	1911	24,743	25.4
1902	20,258	21.3	1912	25,660	25.0
1903	20,963	20.8	1913	27,528	25.2
1904	21,279	20.9	1914	25,115	23.7
1905	21,640	20.0	1915	16,764	16.6

About 11 to 12 per cent of the sawmill laborers are women. Women are used for light work around the plant, as the law restricts the employment of child labor. The sawmill crews were fairly constant before the war, although the Finnish mills have usually failed to closely attach their men to the plants by providing attractive living conditions, such as workmen's homes, etc. The sawmills have usually built only big barracks, and not until recently has any interest been shown in the construction of workmen's homes of a better type.

Before the war the working hours were from 54 to 68 per week. According to official statistics (1912), 75 per cent of all laborers worked more than 60 hours per week. The majority of the larger mills usually ran with two shifts.

During the latter part of 1917 a law was passed limiting the work in most of the industries to 8 hours per shift. There are, however, so many exemptions under this law that generally the working hours in the sawmills are now 9 instead of 8. During the latter part of the war the sawmill operators organized more strongly than before and seem to have the labor situation well in hand.

The Sawmill Owners Employers' Association belongs to a national organization of employers and the labor question is handled in the same way as in Scandinavia. The association decides upon the scale of wages in each district in Finland and all strikes and conflicts are settled by the association and not by the individual employer. The scale of wages has been established in such a way that there is no inducement for sawmill laborers to move from one part of the country to another in order to obtain better wages. This also eliminates reckless competition among the mills in regard to labor. All the members of the employers' association are insured against losses by strikes and labor trouble.

WAGES IN SAWMILLS.

According to official statistics the average wages per day of all sawmill laborers have been as follows:

1899	$0.56	1906	$0.60
1900	.58	1907	.65
1901	.55	1908	.67
1902	.53	1909	.67
1903	.56	1910	.69
1904	.56	1911	.70
1905	.55	1912	.72

In 1912, a normal year before the war, the average wages for all sawmill laborers in the different Provinces of Finland were as follows:

Nyland	$0.79	St. Michel	$0.66
Abo and Bjorneborg	.66	Kuopio	.48
Tavastehus	.63	Wasa	.62
Viborg	.82	Uleaborg	.67

No official statistics of this kind are available for years after 1912. According to semiofficial statistics, in 1913–14 and 1918–19 the wages of the sawmill crews were about as follows:

Employments.		1913–14	1918–19
Log pond:			
Boom men and scalers	per hour..	$0.05¼–$0.07½	$0.27– $0.52
Sawmill:			
Head sawyers	do....	.07¼– .08	.31– .51
Assistant sawyers	do....	.04¼– .06¼	.29– .48
Edgermen	do....	.07¼– .08	.32– .55
Assistant edgermen	do....	.04¼– .05¼	.29– .44
Refuse and cleanup men	do....	.04¼– .05¼	.30– .42
Refuse and cleanup women	do....	.03¼– .04¼	.13– .37
Trimmers in mill, women	do....	.03¼– .04¼	.14– .29
Stave mill:			
Cutters, edgers, and trimmers (men)	do....	.05¼	.27– .42
Truck loaders	do....	.05¼– .07¼	.28– .51
Truck pushers	do....	.04¼– .06¼	.27– .57
Horse drivers	do....	.03¼– .05¼	.29– .49
Yard:			
Pilers and roof layers	do....	.05¼– .07½	.32– .55
Tallymen	per month..	19.30	57.90– 67.55
Shipping:			
Trimmers	per hour..	.06¼– .08¼	(a)
Truck unloaders, women	do....	.04¼	(a)
Marking lengths, women	do....	.04¼	(a)
Loaders in barges, men	do....	.07¼– .08¼	(a)
Transport of refuse, women	do....	.03¼	(a)
Graders, men	do....	.07¼	(a)
Truck loaders	do....	.06¼	(a)
Stenciling lumber, boys	do....	.03¼– .04¼	(a)
Skilled and common labor:			
Chief engineer	per month..	30.88 –48.25	106.15–115.80
Assistant engineer	do....	28.95	82.00
Firemen	do....	28.00 –28.95	82.00
Filers	do....	30.88 –32.81	82.00
Oilers	do....	25.09	77.20
Watchmen	do....	19.30	57.90
Carpenters	per hour..	.07¼	.26– .49
Blacksmiths	do....	.08¼	.26– .49
Mechanics	do....	.08	.26– .49
Clean-up men	do....	.04¼– .05¼	.24– .39
Mill foreman	per month..	28.95 –38.60	96.85
Yard and shipping foreman	do....	24.13 –33.78	82.00

[a] No record, as practically no shipments of lumber effected during this period.

Besides these wages the sawmill laborers generally receive housing accommodations and fuel.

In the majority of cases all work is done on a contract basis, the compensation being based upon a certain sum per thousand logs cut or per thousand pieces piled, etc. These contracts, however, are drawn in such a way that the laborers have been able to earn on an average the above-mentioned wages.

The following rates are typical of those in contracts concerning sawmill labor and refer to southern Finland immediately before the outbreak of the war:

Head sawyer	per 100 logs..	$0.42
Assistant sawyer	do....	.37
Edgerman	do....	.29
Assistant edgerman	do....	.22
Transport of roofing boards and covering piles with roofs	per roof..	.77

The following were average contract rates in southern Finland before the war for operations based on 100 pieces of various dimensions:

Sizes.	Trimming and loading in barge.	Grading.	Piling.
4 by 11 inches	$0.48	$0.65	$1.16
4 by 10 inches	.43	.65	1.16
4 by 9 inches	.41	.58	.97
4 by 8 inches	.39	.58	.77
3 by 11 inches	.41	.51	.97
3 by 9 inches	.35	.46	.58
3 by 8 inches	.33	.42	.50
3 by 7 inches	.29	.39	.50
3 by 6 inches	.25	.35	.43
2½ by 7 and 6 inches	.22	.32	.43
2 by 8 inches	.21	.39	.43
2 by 7 and 6 inches	.19	.26	.34
1½ by 11 and 10 inches	.21	.31	.43
1½ by 9 and 8 inches	.19	.29	.39
1½ by 7 and 6 inches	.14	.24	.29
1½ by 5½-3 inches	.12	.17	.15
1¼ by 11 and 10 inches	$0.19	$0.28	$0.39
1¼ by 9 and 8 inches	.18	.25	.34
1¼ by 7 and 6 inches	.14	.21	.29
1¼ by 5½-3 inches	.11	.15	.24
1 by 11 inches	.19	.26	.34
1 by 10 inches	.19	.26	.34
1 by 9 inches	.17	.24	.29
1 by 8 inches	.17	.24	.29
1 by 7 and 6 inches	.13	.20	.24
1 by 5½-4 inches	.11	.15	.14
⅝ and ¾ by 6-5½ inches	.11	.12	.14
⅝ and ¾ by 5-3 inches	.09	.12	.10
2 by 3-5 inches	.14	.21	.22

The above rates were ruling up to 1917. In comparing wages earned in Finland before and after the war consideration must be given to the fact that the cost of living was very cheap before the war. The laborers were generally able to save a little money. At the present time, however, on account of the abnormally high cost of living, the majority of Finnish sawmill laborers have difficulty in making ends meet. They were, no doubt, financially better off before the war.

In connection with Finnish labor, it should be mentioned that the public-school system in Finland is excellent and illiterates among the native laboring class are rare. In some remote districts in the interior the facilities for attending school may be unsatisfactory, but in all the cities and fairly densely populated districts the educational facilities for the working class are among the best in Europe.

CHARACTER OF EMPLOYEES.

The Finnish sawmill laborers are a difficult class of people to handle, and labor troubles and strikes were common even before the war. The sawmill crews are, to a large extent, recruited from the former small landowners and their sons, who have taken up work in sawmills after their lands and forests were sold to the wood-using industries. These people feel unsettled and discontented and the low wages in connection with the increased cost of living made them susceptible to Russian Bolshevik propaganda during the war.

One trouble with the laboring people in Finland is that they have not generally owned any property, and have not, therefore, felt attached to the districts where they worked. As a whole, the Finnish sawmill laborers are of a peculiar disposition. The dissatisfaction which they harbor in regard to their own position has killed ambition, and instead of trying to better their conditions they prefer to look upon their employers and other people in authority with a bitter feeling of envy. However, some of the most prominent lumber men in Finland have risen from the laboring class, which is proof that there are possibilities of advancement for ambitious men.

Since the defeat of the Bolshevik element in Finland in 1918, very little labor trouble has been experienced, and it is hoped that conditions may become more settled in the future, especially since many important laws have been passed bearing upon betterment of the conditions of the laboring classes, such as the limitation of working hours and liability insurance, and there are also under consideration plans for facilitating the acquisition of land by the working people.

COST OF PRODUCTION.

In the past very few mills have paid much attention to cost accounting, and there are probably not more than a dozen mills in Finland that have any idea of what their real cost of production has been. Not only have they generally figured with too low charges for stumpage, but they have also failed to make adequate charges for depreciation on their plants, interest on the capital invested, etc. There are mills that have no cost-accounting system whatever. It is evident that the lack of knowledge regarding the cost of production has led to unfair competition, many mills having sold below cost. These conditions may change in the future, as it is now realized that cost accounting is inseparable from an intelligent selling policy.

While the prewar cost of production may be fairly well estimated, it is next to impossible to give any definite statement in regard to the cost of production during the last three years. Conditions have been entirely upset, and wages have changed from one week to another. Particularly the values placed on stumpage must necessarily be arbitrary. Furthermore, the efficiency in the mills, yards, and in loading of ships has decreased at least 20 to 25 per cent on account of unsatisfactory food conditions for a long time past. The working hours have also been reduced since 1917. Since the revolution many of the old sawmill crews have been scattered, and a great many men have been killed.

While in the past about 6 to 8 per cent net was considered as a fair average profit in the sawmill business, such a small percentage would be entirely unsatisfactory at the present time, considering the enormous risks and expenses connected with the keeping of large stocks of lumber on hand during the war, at a time when the Bolsheviks threatened to destroy all property of this nature in Finland.

The close utilization of waste material which is being started now will increase the profits materially, although the Finnish lumbermen will not probably, for a good many years, be as proficient in the utilization of waste as the Swedish and Norwegian lumbermen, because the ample supply of raw material in Finland does not necessitate such steps in order to make a profit.

AVERAGE PREWAR COSTS.

The following statement of cost of production has been compiled from various statements of a great many mills in southern Finland, giving due consideration to overhead charges and stumpage. It is based on a mill production of 20,000,000 board of pine and spruce lumber annually in 1913 and 1914. Costs have been calculated per 1,000 board feet and converted to United States currency at the par value of the Finnish mark ($0.193).

Logs in pond, 124 cubic feet (equal to 1,000 board feet of sawn lumber), at 9.7 to 10.25 cents per cubic foot		$12.03–$12.71
Log pond: Storing of logs and transportation to mill		.38– .49
Sawmill:		
Gang sawing	$0.32–$0.34	
Edging	.12– .15	
Rough trimming in mill	.04– .08	
Transportation of refuse	.09– .12	
Loading on trucks	.19– .29	
Firemen and oilers	.07– .10	
Filers	.05– .07	
Machinists	.10– .15	
Supplies	.15– .19	
Supervision	.07– .10	
Various expenses (repairs)	.38– .43	
		1.58– 2.02
Yard:		
Transportation from mill to yard	.15– .19	
Piling	.29– .31	
Covering of piles with roof	.03– .05	
Repair of yard	.10– .22	
Supervision	.07– .10	
		.64– .87
Shipping:		
Trimming and grading	.29– .34	
Loading into barges	.29– .43	
Repair and depreciation of barges	.19– .29	
Tugging to ships	.10– .15	
Export duty, port dues, etc	.10– .17	
		.97– 1.38
Overhead charges:		
Depreciation of plant	.49– .58	
Interest	.29– .63	
Administration and taxes	.49– .58	
Agents' commission	.39– .41	
Insurance (fire and liability)	.15– .19	
		1.81– 2.39
Total cost of production		17.41– 19.86

While the charges for labor may be fairly constant, the overhead charges vary greatly and are merely estimated. The charge for interest is very difficult to estimate, as the time which passes between the cutting of the log in the forest until the lumber is shipped may be anywhere from one to three and a half years and even four years in some cases. It is expected that the charges for taxes will be heavily increased in the future.

The sawing of small dimensions such as laths, broom handles, box shooks, etc., involves increased charges for labor and handling amounting to two or three times the charges for planks, battens, and boards.

The cost of production in the smaller mills is naturally considerably less than that in the larger mills, on account of the smaller overhead charges. The lowest figure obtained for any mill in Finland, in 1913–14, was $16.50 per 1,000 board feet. No doubt many mills would claim that they could at that time produce lumber at a lower cost, but this is improbable if adequate charges were made for stumpage and overhead expenses. A cost of $16.50 per 1,000 feet represents the minimum for lumber production in Finland before the war, and in 1918–19 it is not believed that any one could produce lumber for less than 333.40 Finnish marks ($64.35 at par value).

The cost of production during 1918 and 1919 is very difficult to determine, because conditions were entirely upset at this time and there is a very unsatisfactory basis of comparison between the cost before the war and the cost during this period. The cost of labor, supplies, etc., varied as much as 75 to 80 per cent among mills in the same district. It is estimated that the average total cost of production, allowing adequate charges for stumpage, would be at least 333 to 388 Finnish marks per thousand board feet.

The increase of wages is shown in a table given in a previous section (p. 81). In regard to accessories and supplies, the increase during the latter part of the war was formidable. For instance, in 1914, the price for lubricating oils was 0.28 mark per kilo; in 1916 it was 0.65 mark, and in January, 1919, 15 marks. Four-inch belting sold in 1914 for 7.20 marks per meter; in 1916 for 16.60, and in January, 1919, for 165 marks.

PRODUCTION COSTS IN GOVERNMENT MILLS.

Although it is not believed that the Government-operated mills in 1914 could be considered as standard mills in regard to the cost of operation, it is of interest to consider an official statement showing the cost of production.

The official statistics covering the operation of the Kevatniemi sawmill in eastern Finland gives the following information: In 1914, 41,407 logs were cut, holding on an average of 7½ cubic feet per log; the average length of these logs was 18 feet; the average distance which these logs had to be driven to the nearest waterways was 1½ miles; the cost of cutting and driving was 16.4 cents per log; the average floating distance was 62 miles, and the cost of floating per log was 8.7 cents. These figures refer to the Lieksa River district. In other districts 132,710 logs were cut, but the Lieksa River district is typical for the whole logging region.

In the sawmill 160,348 logs were sawn in 403 shifts. Some of these logs, however, were passed twice through the gang saws, thereby making a total of 187,084 sawing operations, or 464 sawing operations per shift.

The following quantities of pine lumber were produced:

	Board feet.
Planks	543,000
Battens	2,237,000
Scantlings	352,000
Boards	3,782,000
Sawn small timber	351,000
Slating battens	214,000
Building material	83,000
Total	7,562,000

The following quantities of spruce lumber were produced:

	Board feet.
Planks	24,000
Battens	277,000
Scantlings	79,000
Boards	309,000
Slating battens	14,000
Total	703,000

The following quantities were cut from the waste material of both pine and spruce:

	Board feet.
Broom handles	61, 000
Staves	317, 000
Inferior cull lumber	533, 000
Total	911, 000

The total production of pine and spruce of this mill was thus 9,176,000 feet, or 22,800 feet per shift. The cost of sawing, piling, loading on railroad cars, etc., was $2.85 per thousand feet.

A planing mill was operated in connection with the sawmill. This mill operated 121 shifts and dressed 232,000 board feet at a cost of $1.53 per thousand feet. The entire plant produced 1,210,260 cubic feet of firewood at a cost of 0.3 cent per cubic foot and 32,900 cubic feet of charcoal at a cost of 1.8 cents per cubic foot. In computing these costs it is believed that very low charges have been made for administration, depreciation, etc., and that the charges cover mainly labor, repairs, supplies, etc.

COST OF STOCKS ON HAND.

The cost of production for 1918–19 can not be considered as the average for the large stocks now on hand in Finland. The majority of these stocks were probably manufactured at a cost of about $19.50 to $22.50 per thousand feet, as most of the timber was cut during the early part of the war when the cost of production had not advanced to any great extent. The following statement gives an idea of the average cost, per thousand feet, of the majority of these stocks at the end of 1918:

Total cost of production	$19. 50
Interest	6. 76
Fire insurance	2. 90
Administration and other expense	2. 50
Depreciation of quality	. 25
Repiling and extra caretaking	2. 50
Total	34. 41

There were times during the war when fire insurance on these stocks would probably have been refused by private companies even at a premium of 50 per cent, in view of the danger of having them burned by the Bolsheviks.

ALLIED INDUSTRIES.

PULP AND PAPER FACTORIES.

Statistics covering the industrial activities of Finland for 1915 give the following data in regard to the pulp and paper industries of the country:

Kinds.	Number.	Annual production.	Value of production.
		Tons.	
Mechanical pulp and cardboard factories	43	242, 000	$4, 034, 000
Cellulose factories	19	157, 000	5, 983, 000
Paper factories	27	205, 000	13, 626, 000

The exports of the products from these mills in 1912 and 1913 were valued as follows: Mechanical wood pulp, $883,000 in 1912 and $780,000 in 1913; cellulose, $2,877,000 in 1912 and $2,799,000 in 1913; cardboard, $1,470,000 in 1912 and $1,608,000 in 1913; paper, $7,139,000 in 1912 and $8,396,000 in 1913.

Although these factories obtain the larger part of their raw material from their own forests, they also make large quantities of pulp from sawmill waste. Many of them are owned or partly controlled by sawmill owners. The pulp mills are mainly located in southern Finland and very few are found in the northern sections of the country.

WOODWORKING PLANTS.

The following table gives some data regarding the value of the exported products of other wood-using industries:

Products.	1912	1913	Products.	1912	1913
Joinery of all kinds	$275,000	$428,000	Charcoal	$108,000	$134,000
Excelsior	11,000	10,000	Turpentine	4,000	13,000
Bobbins	1,097,000	1,202,000	Tar (wood)	98,000	105,000

The furniture industry (including veneer products) is not very important, but has in the past produced some quantities for export to Russia and other countries. The bobbin factories, using birch as raw material, depend mainly on Great Britain as a market for their product. Sash and door factories are exporting limited quantities and there are a few other small industries not of great importance to the export trade.

The following statistics are for 1915:

Factories.	Number.	Employees.	Value of production.
Excelsior factories	5	56	$35,000
Veneer factories	4	399	315,000
Shipyards for building wooden ships	16	466	433,000
Furniture, sash, and door factories	82	2,164	1,970,000
Bobbin factories	14	2,155	1,438,000
Wood-turning factories	3	224	109,000
Wagon-stock factories	1	110	112,000
Box factories	5	287	285,000
Ski factories	5	32	30,000
Handle factories	4	30	30,000
Molding factories	2	43	34,000
Wood distilleries and tar and pitch plants	15	85	106,000
Turpentine plants	2	58	76,000

BUILDING OF WOODEN SHIPS.

The building of wooden ships flourished at one time in Finland, but at present it is difficult to obtain skilled shipbuilders. The principal districts where wooden vessels are constructed are Viborg and Raumo and a few ports on the western coast.

The common type of wooden vessels has a capacity of 400,000 feet of lumber and is equipped with auxiliary engines. Before the war these vessels cost from $30,000 to $40,000. Some of the more enterprising lumber companies have planned to build several wooden vessels that can load at interior mills and take lumber to near-by markets, such as Germany, Holland, the United Kingdom, and Denmark.

READY-CUT HOUSES.

So far as can be learned, Finland has not until recently considered the manufacturing of ready-cut houses on a large scale. Lately there have been projects to establish special plants for this purpose, as it is believed that there will be a large demand for this stock in the future. No definite steps have been taken so far to establish factories and the small production of ready-cut houses in Finland has been destined for local consumption.

LUMBER EXPORT TRADE.

DEVELOPMENT OF EXPORT TRADE.

The lumber export trade in Finland started on a large scale with the construction of steam sawmills about 60 years ago. The pioneers in this trade were to a large extent former Government officials who were forced to leave that service on account of difficulties with Russia. These persons were characterized by high moral standards. It is of great importance to note this fact, because this explains why the Finnish exporters right from the start have been able to acquire such an excellent reputation for integrity in their dealings, and this reputation has been carefully kept ever since. Dishonest exporters have not found a profitable field in Finland and sooner or later have been forced out of business.

The first shipments of lumber were made by commission merchants, some of whom operated sawmills themselves, but mainly they made up cargoes from stock which they purchased from other small mills. At that time the Finnish exporters did not sell through agents, but gave the captain of the sailing vessel orders to proceed to a certain country and to sell the lumber to the best advantage. This system, however, was unsatisfactory, and as the lumber business grew it was found necessary to have special representatives abroad who could take care of the exporters' interests and to sell in markets where the lumber commanded the highest prices.

The steady growth of the Finnish lumber export until the war is shown by the following statement, which gives the value of the total exports of timber and lumber from 1836 to and including 1914. The values cover total shipments of logs, timber, lumber (rough and planed), firewood, etc., of all species of wood.

1836	$826, 000	1898	$17, 597, 000
1846	1, 219, 000	1899	18, 950, 000
1856	1, 061, 000	1900	21, 327, 000
1860	1, 846, 000	1901	19, 011, 000
1865	3, 612, 000	1902	21, 684, 000
1870	2, 555, 000	1903	24, 505, 000
1875	7, 271, 000	1904	22, 473, 000
1880	10, 759, 000	1905	23, 248, 000
1885	7, 607, 000	1906	27, 037, 000
1890	6, 874, 000	1907	26, 921, 000
1891	8, 473, 000	1908	24, 335, 000
1892	7, 807, 000	1909	25, 238, 000
1893	9, 211, 000	1910	30, 066, 000
1894	11, 722, 000	1911	30, 977, 000
1895	11, 767, 000	1912	32, 085, 000
1896	13, 280, 000	1913	42, 235, 000
1897	15, 331, 000	1914	21, 179, 000

An important percentage of the exported forest products consists of timber and other unmanufactured stock. This has given a great deal of concern to the Finnish authorities, as it is realized that exportation of raw material is depriving the country of large sums of money which would be paid to Finnish laborers in the form of wages if the stock were manufactured into lumber and other wood products.

In order to demonstrate the great economic loss which was suffered by Finland before the war in exporting forest products unmanufactured, the following comparison is given, which shows the value of 1,000 cubic meters (35,300 cubic feet) of pine and spruce when exported as props and when manufactured into various products: Props, $135; mechanical pulp, $425; cellulose, $525; paper, $1,119. These figures represent values before the war. At the present time the manufactured products would show a very much higher value in proportion to the raw material. If the quantities of props exported in 1913 had been manufactured into cellulose the wages paid in the manufacture would have been $1,200,000, and if turned into paper they would have been $2,600,000. The wages paid during this year for the cutting and exporting of the props was only $120,000.

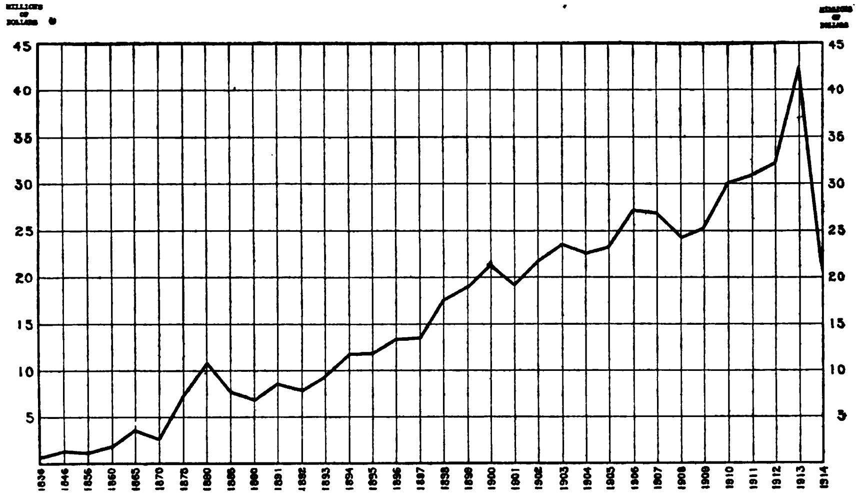

FIG. 20.—Value of exports of all species of logs, timber, lumber, firewood, etc.

The above statement was published by a special committee advocating that steps be taken by the Government to encourage the manufacture of different wood products in Finland instead of exporting the raw material. The new export duties will likely, to a great extent, check the exportation of unmanufactured wood, particularly logs of small dimension.

EXPORT DUTY.

Prior to 1919 a small export duty and a special tax on sawmill products were levied in Finland by the Government. The export duty on small timber—pulp wood, props, and similar stock—was intended to check the cutting down of young forests, but the duty was too small to have the desired effect. The duty amounted to

75 penni per cubic meter ($0.004 per cubic foot) on telegraph poles, ties, props, pulp wood, and similar stock, and to 45 penni per cubic meter ($0.0026 per cubic foot) on sawlogs and other kinds of round and hewn timber. The tax on sawmill products was 15 penni per cubic meter for stock 2 meters and up in length ($0.068 per thousand board feet) and 6 penni per cubic meter for stock less than 2 meters in length ($0.028 per thousand feet).

The total amounts of the export duty and the special tax on sawmill products collected during the last years before the war were as follows: In 1911, export duty $232,000, sawmill tax, $77,000; in 1912, export duty, $251,000, tax $77,000; in 1913, export duty, $347,000, tax $116,000. The export duty was not levied on wood products shipped to Russia.

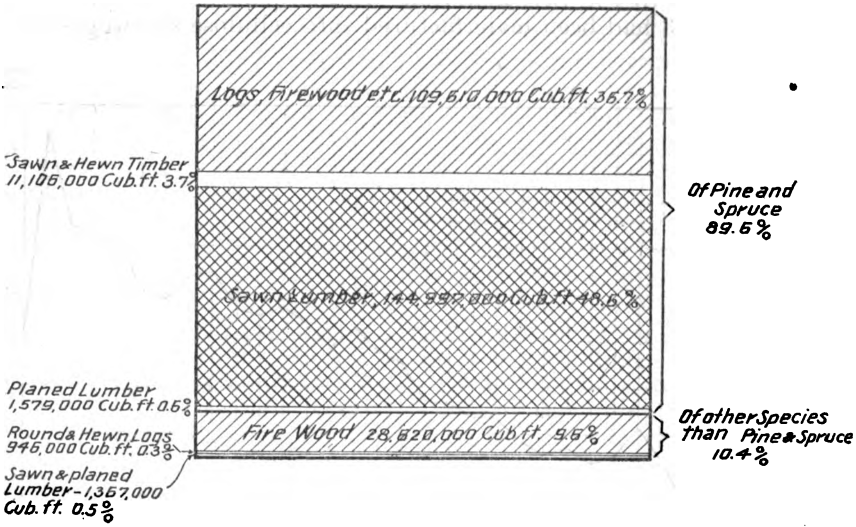

FIG. 21.—Exports of all kinds of wood in 1913.

The recently increased expenditures of the Finnish Government necessitated new taxes and a revision of the export duties on wood products. On March 26, 1919, the following tariffs went into effect:

Round timber, logs, small timber, etc., of pine and spruce, 6½ feet long and up	$0.0273 per cubic foot.
Telegraph poles, railroad ties, props, pulp wood, and other similar stock of pine and spruce, irrespective of length	.0328 per cubic foot.
Firewood of all kinds, based on measurement of pile	.0328 per cubic foot.
Round or hewn aspen and birch stock	.0273 per cubic foot.
Planed or rough lumber of all kinds of pine and spruce in lengths 6½ feet and up	2.731 per 1,000 feet.
Pine or spruce stock of less than 6½ feet in length	.91 per 1,000 feet.
Partly sawn or hewn stock having a maximum of $3\frac{9}{64}$ inches in width and $1\frac{3}{4}$ inches in thickness and sawmill products of all other species of wood, based on measurement of pile	.0273 per cubic foot.
Veneer of all kinds	.002 per pound.

This new tariff has energetic opposition from the lumber exporters in Finland, and this may eventually lead to a reduction, as it is felt that the export duty is very heavy.

SELLING METHODS.

The contracts covering sales of Finnish lumber are the same as those used in Norway and Sweden. This is a great improvement over conditions in other countries, where each exporter has his own standard contract, and eliminates unfair competition. The contracts have been prepared by exporters and importers jointly and are very satisfactory in every respect.

During normal times the bulk of the lumber for shipment "at first open water" the following year is sold during the months of August and September.

The Finnish exporters send stock lists to their agents. It is claimed that it often is easier to have the Finnish exporters conform to the importers' desires in regard to specifications than it is in Sweden and Norway.

Finnish lumber has, in the majority of cases, been sold on an f. o. b. basis. Only when the market was dull have exporters sold on a c. i. f. basis, and then only in exceptional cases.

FOREIGN AGENTS.

Before the war almost the entire amount of lumber exported from Finland was handled through agents in the same way as Scandinavian lumber is sold.[1]

Most of the large firms in Finland give one agent the sole right to handle their products, either in a given territory or in all foreign markets, but several of the small exporters sell through any agent who happens to offer his services.

The terms of sale are the same as those used by the Scandinavian exporters, but it is stated that before the war some of the Finnish exporters were more or less in the hands of their foreign agents and dependent upon them for advances on cargoes to be shipped in the future.

Sometimes the agents have bought cargoes on speculation, but it is expected that this practice will be entirely abolished in the future, because the Finnish lumber exporters have materially bettered their financial position during the war and the financially weak concerns have mostly disappeared.

The Finnish exporters have large amounts of capital tied up in their plants, forests, and logging operations, and they have generally been unable to extend long credits to foreign importers. They have, therefore, availed themselves of the services of the agents, drawing on them as soon as a cargo was loaded, and the agents have made special terms with the importers in regard to the extension of credit. Only in rare cases have the Finnish exporters given credit to their foreign customers. In drawing on the agents the exporters have always obtained 100 per cent of the value of the cargo, as there has been no danger of having the exporters disregard claims or otherwise cause the agent any financial loss. In this connection it may be mentioned that there have been very few failures among the Finnish mills.

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[1] See "Swedish Forests, Lumber Industry, and Lumber Export Trade," Special Agents Series No. 195.

DIRECT DEALINGS AND CONSIGNMENTS.

Direct exporting of lumber without the use of an agent is so rare that it may be entirely left out of consideration.

The Finnish lumbermen have been accused in the past of having consigned an unduly large percentage of their output. A change in this respect may be expected in the future, as a result of the work of the association.

The Finnish exporters have not endeavored to establish themselves abroad as agents or importers, and it may be said that they have not in the past made any special efforts to improve the established selling methods or to push their products in new markets. Their methods of selling are conservative.

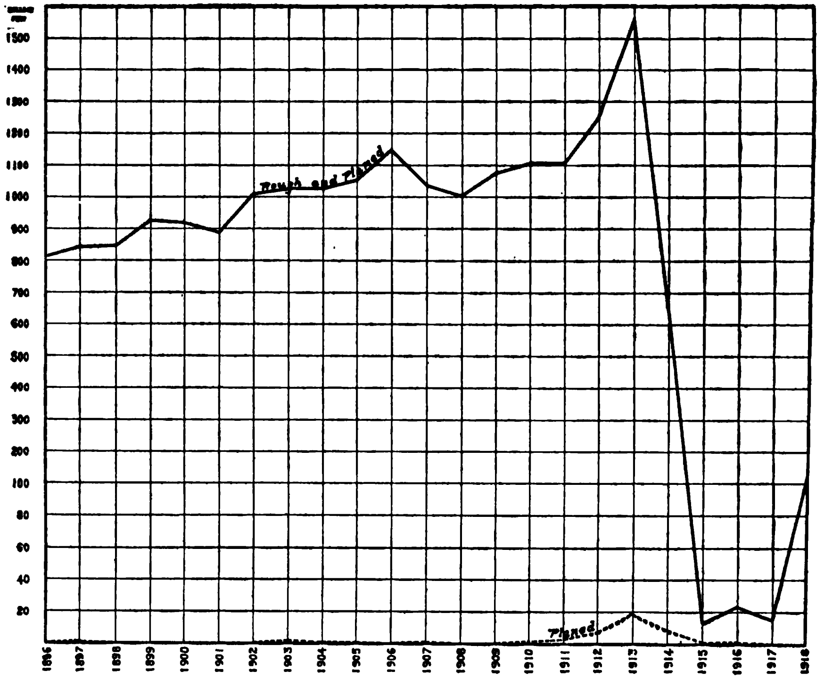

FIG. 22.—Exports of pine and spruce planks, battens, and boards, 1896 to 1918.

EXPORT AGENTS.

Before the war there were practically no Finnish export agents selling lumber on a commission basis. A few export merchants purchased lumber from interior mills and exported it. Except in two or three cases, these export merchants have not played an important part in the Finnish lumber export trade. Since the war a change has taken place, with the establishing of a considerable number of so-called trading companies that handle any kind of merchandise, including lumber. Their activities will probably be limited to new markets and they may do the Finnish lumber exporters some good by opening up new fields. It is expected, however, that as soon as new markets of any importance have been opened the Finnish lumber exporters themselves will go into these fields.

Props and small timber are to a great extent handled by export merchants, who at times may engage in the cutting of such stock and also may own timberlands.

FOREIGN BUYING AGENCIES.

British concerns have established buying agencies in Finland for props and mining timber. These agents pay cash for their purchases and attend to all the details in regard to shipping, etc. The reason for this procedure is that Finland has no satisfactory arrangements for the measuring of props and timber, such as the Official Bureau of Inspection in Norway. Previously, there was always more or less dispute in regard to the measuring of timber and props, and in order to avoid difficulties of this kind it has been found more satisfactory to handle the purchases of props through buying agents.

Lumber, on the other hand, is not inspected by the importer at port of loading and there are no buying agents representing foreign importers of this commodity in Finland. Foreign agents may, however, have representatives in Finland to take up directly with shippers various matters which may arise.

COMPETITION.

In the past, the principal competition has been from Russia, chiefly from the Baltic region. It is claimed that the competition from this source has sometimes been unfair. Russian lumber from the White Sea ports also competes with Finnish lumber, but this competition has not been so keen, because the freight rates from these ports to the principal European markets were approximately $2.45 per thousand feet higher than from Finnish ports to the same markets before the war. The Russian exporters' strong point is their ability to furnish long lengths and wide stock, but their inefficient methods of handling the lumber export trade does not yield as satisfactory returns as might be expected.

The competition from Sweden has been keen until recent years, but since the associations in Sweden and Finland have cooperated in the fixing of prices, this competition is to some extent eliminated.

Lumber from Finland has at times been in direct competition with southern yellow pine. In a few cases, before the war, it was reported that southern yellow pine was sold in the same markets in Europe as Finnish pine at $24.70 per thousand feet c. i. f. European ports, while Finnish lumber was sold at $19.66 per thousand feet f. o. b. Finnish ports, with freight from Finland to this particular point at approximately $5 per thousand feet. This is almost incredible when the superior quality of southern yellow pine and the ability of southern-pine exporters to furnish almost any size required is taken into consideration. The Finnish exporter can furnish only limited quantities of wide stock and long lengths.

Norwegian lumber has not entered into competition to any great extent with Finnish lumber, because the bulk of the lumber shipped from Norway is planed, while Finland specializes in rough stock. Besides, Norway can ship during months when the Finnish ports are closed.

CLAIMS.

Only limited information can be obtained in regard to claims, as the exporters generally are anxious to settle these to the satisfaction of their customers. Litigations in court regarding defective shipments are rarely heard of in connection with Finnish lumber shipments.

In the settling of claims the Finnish exporters generally have their agents act as their representatives, but in some cases the experts of the Swedish Lumber Exporters' Association have been called upon for assistance. The principal basis for claims has been discoloration, as some exporters in Finland have been inclined to ship discolored stock. An improvement in this respect may be expected, because the production of Finnish lumber is in the hands of larger concerns than formerly and is now more standardized.

It can not be denied that a great many unreasonable claims have been made in regard to Finnish lumber. It often happens that the importers complain without reason that the stock is discolored. The lumber may have been shipped perfectly dry, but by being left on the piers in the importing country and exposed to the elements it may have turned blue at port of destination before the importer obtained possession of it.

In settling claims for blue lumber a reduction of $2.45 per thousand feet for boards and $1.23 per thousand feet for planks and battens was usually made before the war. Like the Scandinavian exporters, the Finnish exporters are very conscientious in regard to the filling of specifications and shortage very seldom gives reason for complaint.

PRICES.

The dimensions indicated by the different terms used in the Finnish lumber export trade are as follows:

Names.	Minimum thickness.	Minimum width.
	Inches.	*Inches.*
Planks	3	8½
Battens	2	6
Small battens	2	4
Scantlings	2	2
Boards	1	6
Small boards	1	4

Stock less than 1 inch thick and 6 inches and up in width is also termed "small boards." Box boards or case boards are 1¾ inches in maximum thickness and 3½ inches in maximum width, but may be ⅞ of an inch in maximum thickness and 5½ inches in maximum width.

The prices of Finnish lumber fluctuated a great deal in the first period of the lumber export trade. For instance, in 1870–71 the average price of Finnish lumber for export was approximately $11.50 per thousand feet. In August, 1874, the price climbed to $18.50 and six weeks later dropped to about $11 and remained at this low figure for six years. Later the fluctuations were not so important, owing to the better organization of the lumber export trade. Naturally, the abnormal conditions during the war caused a material increase in prices, but they have been climbing steadily and there has been no drop.

AVERAGE PRICES BY YEARS.

The following statement gives the average price per thousand feet of pine lumber for export, based on 2½ by 7 inch unsorted quality, from a representative district in southern Finland from 1895 to 1914, inclusive:

1895	$13.51	1905	$17.83
1896	14.13	1906	19.36
1897	15.97	1907	21.51
1898	17.83	1908	17.83
1899	17.21	1909	19.06
1900	19.66	1910	20.89
1901	19.97	1911	20.28
1902	17.21	1912	19.06
1903	19.36	1913	20.58
1904	17.21	1914	20.89

Spruce lumber usually sold at a reduction varying from $1.23 to $2.45 per thousand feet. The Finnish prices for standard production have generally followed the Swedish quotations and have been about $1 to $2.50 per thousand feet below the prices of lumber of corresponding grades from the Hernosand district in Sweden.

Finnish lumber has frequently been sold at very low prices, particularly the smaller dimensions. Such stocks of the unsorted grade sometimes brought a price only 45 to 90 cents per thousand feet higher than Swedish fifth-grade lumber.

The following prices from a contract covering a sale made during 1913 are representative for such unsorted pine lumber: 9 inches, $21.66 per thousand feet; 7 inches, $19.23; 6 inches, $18.33; 5 inches, $17.42; 4 inches, $15.64.

The prices for Finnish lumber are to a great extent dependent on the location of the port, the brand, the nature of the specifications, the reputation of the shipper, and the ability to ship early in the season. The freight question did not play a very important part before the war, when the difference in rates between the various districts in Finland seldom exceeded 61 cents per thousand feet. The scale of prices covering the various dimensions and grades was very unstable in Finland before the war, and there were hardly two mills applying the same scale. This question has lately been taken up through the work of the lumber association.

The following statement shows the approximate reductions per thousand board feet from basic Kotka-Bjorneborg prices for shipments made from other shipping districts:

Shipments of pine from—	
Borga and Fredrikshamn	$0.49
Kemi	.98
Tornea	1.46
Uleaborg	1.46
Viborg	2.45
Abo	2.45
Wasa	2.93
Brahestad, Ny Karleby, Gamla Karleby, and Jakobstad	2.93
Shipments of spruce from—	
Viborg	.49
Abo	.49
Other districts	.98

AVERAGE PRICES BY DIMENSIONS.

The following table gives an idea of the average prices obtained for the different dimensions of the unsorted grade of pine and spruce, covering average good productions in southern Finland, during 1913–14:

Thickness.	Width.	Sterling per Petrograd standard.	Dollars per 1,000 feet b. m.
	Inches.	*£ s. d.* *£ s. d.*	
2, 2½, 3, and 4 inches	11	10 15 0	26.40
	10	10 10 0 to 10 15 0	25.78 to 26.40
	9	10 10 0 to 10 15 0	25.78 to 26.40
	8½	9 10 0	23.33
	8	9 5 0 to 9 10 0	22.72 to 23.33
	7	8 15 0 to 9 0 0	21.51 to 22.10
	6½	8 7 6 to 8 10 0	20.58 to 20.89
	6	8 2 6 to 8 5 0	19.97 to 20.28
	5½	7 15 0 to 8 0 0	19.06 to 19.66
	5	7 15 0	19.06
	4½	7 10 0 to 7 15 0	18.44 to 19 06
	4	7 10 0	18.44
	3	7 5 0	17.83
1, 1¼, and 1½ inches	11	11 5 0 to 11 10 0	27.63 to 28.25
	9	10 15 0 to 11 5 0	26.40 to 27.63
	8	9 0 0 to 9 5 0	22.10 to 22.72
	7	8 15 0 to 9 0 0	21.51 to 22.10
	6½	8 10 0	20.89
	6	8 5 0 to 8 10 0	20.28 to 20.89
	5½	8 2 6 to 8 5 0	19.97 to 20.28
	5	8 0 0 to 8 2 6	19.66 to 19.97
	4½	7 10 0 to 7 15 0	18.44 to 19.06
	4	7 10 0	18.44
	3½	7 0 0	17.21
	3	6 15 0 to 7 0 0	16.59 to 17.21

There are no official statistics of any kind published in regard to lumber prices in Finland. Spruce was formerly sold at approximately 10 per cent less than pine, but the difference immediately before the war was very small and in some cases spruce was sold at even higher prices than pine.

RELATION OF PRICES BASED ON GRADES.

When lumber was graded into four different qualities, the following values were generally added to the qualities above fourth grade:

Seven-inch battens: Third grade, $2.46; second grade, $4.91; and first grade, $8 per thousand feet above price of fourth grade.

Eleven-inch boards: Third grade, $4.92; second grade, $12.28; and first grade, $24.55 per thousand feet above price of fourth grade.

Four-inch boards: Third grade, $3.08; second grade, $7.37; and first grade, $13.51 per thousand feet above price of fourth grade.

Eleven-inch planks: Third grade, $5.54; second grade, $11.68; and first grade, $20.28 per thousand feet above price of fourth grade.

In some cases the unsorted quality of 9-inch planks was graded into three qualities and the price of each one of these qualities in relation to the price of the unsorted quality was as follows: First grade, $3.38 per thousand feet higher than unsorted grade; second grade, $0.92 per thousand feet higher than unsorted grade; third grade, $1.54 per thousand feet lower than unsorted grade.

The better grade of cull lumber was sold at a reduction of approximately $1.35 to $2 per thousand feet below the price of the unsorted grade. The poorer class of cull lumber was not exported. Some shippers made a specialty of exporting battens with a larger amount of wane than usually shipped.

Such battens in widths of 6½ and 7 inches were sold at a reduction of approximately $1 per thousand feet below the regular stock of unsorted grade.

Lumber is generally sold on the basis of average length. In a few cases orders have been taken for specified lengths at an additional charge. A few shippers made a specialty of supplying difficult specifications calling for extra-long lengths, particularly for South Africa. For this market the exporters generally obtained approximately $2.45 per thousand feet extra for all stocks, on account of the more careful seasoning and handling required. For specified lengths a charge of $2.45 to $4.90 per thousand feet was usually made.

Some importers demanded scantlings with the saw cut through the center of each piece. For this stock an extra charge of $1.23 per thousand feet was usually made. An extra charge was also generally made for 1¾, 1⅛, ⅞, ½, and sometimes for ¾ inch stock. There was no fixed extra charge for these dimensions, but it depended upon the general nature of the specifications. The extra price charged ranged from 61 cents up to $2.45 per thousand feet.

Spruce boards were generally sold at about $1 per thousand feet higher than pine boards, if the boards were of good quality. The usual dimensions of spruce boards were 4, 4½, 5, 5½, 6, and 7 inches.

The Danish importers especially were in the habit of splitting cargoes into a great many dimensions, ordering a few thousand feet of each size. These cargoes, called "salad cargoes," gave the exporters a great deal of trouble in extra handling. Before the war competition was very keen, and the exporters could not charge more than about $1 per thousand feet extra for filling such specifications, and often no extra charge was made.

In cases where the importers ordered absolutely square-edged lumber, an extra charge of approximately $1 per thousand feet was made. The keen competition among the Finnish exporters before the war often caused not only price cutting but also "sweetening" of the grades; that is, one exporter would supply lumber almost square-edged in cases where such stock was not covered by the price.

EXTRA CHARGES FOR SPECIAL DIMENSIONS.

Since it was difficult for exporters in Finland to supply any large quantity of wide stock, there was always some bargaining to have the customer either pay extra charges for any excess quantity of wide dimensions beyond the normal percentage in a standard specification, or take at the same time some unsalable stock which the exporter might have on hand. For instance, if an exporter in Finland would be willing to supply a large percentage of 3 by 9 inch planks, which are always in great demand, he would, besides charging a high price for this lot, try to make the importer take a quantity of 1½ by 5½ inch pine boards, which at times are difficult to sell, because there is almost no demand for this dimension. In the case of special stock, such as 1¾ inch, the exporter often demanded that the importer take other odd sizes which would be produced in cutting 1¾-inch stock.

Such odd dimensions were frequently contracted for in large quantities, the delivery of which would often extend through several years.

An idea of the normal percentage of each width of the stock dimensions turned out by Finnish mills, is given in the following statement, which represents one of the best assorted stocks in Finland:

	Per cent.		Per cent.
11-inch planks	1.9	11-inch boards	1.5
10-inch planks	.5	9-inch boards	2.5
9-inch planks	11.3	8-inch boards	1.8
8-inch battens	3.1	7-inch boards	11.4
7-inch battens	26.2	6-inch boards	17.6
6½-inch battens	.2	5½-inch boards	6.4
6-inch battens	18.2	5-inch boards	10.6
5-inch scantlings	15.1	4½-inch boards	11.6
4-inch scantlings	23.5	4-inch boards	36.6
	100.0		100.0

It is evident that there can not be a fixed relation between the prices of different dimensions, because the exporter must keep in close touch with the demand, and the call for one dimension may be heavy one year and light the next. For instance, 2 by 4 inch and 2 by 3 inch stock is often sold at the same price, and this also applies to 2 by 4½ inch and 2 by 3½ inch stock.

The price for planed lumber was usually based on the price for rough lumber, to which was added the charge for planing, usually about $2.45 per thousand feet. This charge barely covered the actual expense for planing. Planed lumber was usually graded into two qualities, colonial first and colonial third, colonial first selling about $3.07 above the price of colonial third. In grading the planed lumber, about 80 to 85 per cent would be colonial first and 15 to 20 per cent colonial third.

For bundling of planed lumber a charge of 52 cents per thousand feet was made. Thin planed stock commanded about $3.68 extra per thousand feet. The extra charges for planing of various patterns were generally made on the same basis as the charges in Sweden and Norway. The prices of small-dimension lumber were, on an average, as follows during 1913–14:

Split wood sawn from—		
Planks and battens	per cubic fathom (216 cubic feet)	$15.80–$19.47
Boards 6 inches and wider	do	14.60
Boards 5½ inches and less	do	12.16
Cement staves	per thousand feet	15.16– 17.21
Broom handles	do	19.66– 26.46
Slating battens	do	15.97– 17.21
Laths	do	17.21– 19.66

DOMESTIC PRICES.

In the domestic market the same peculiar condition applies to Finland as to the Scandinavian countries, where the domestic market pays better prices than foreign markets. The domestic market takes

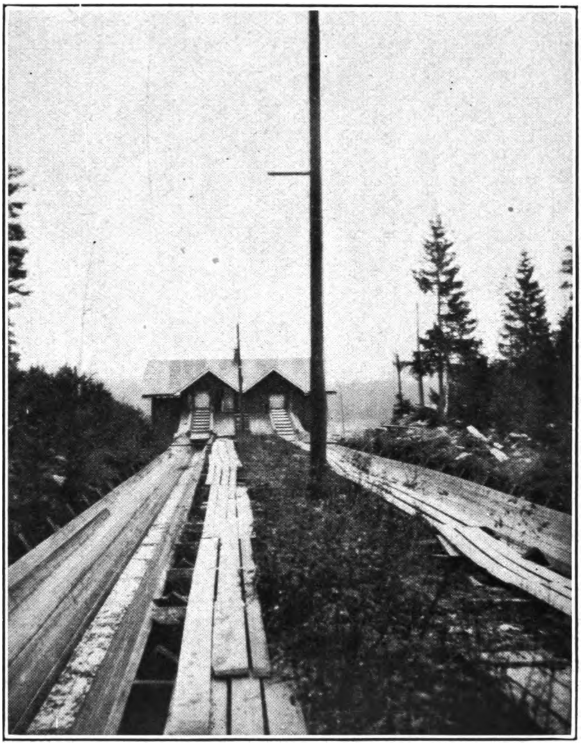

FIG. 23.—FLUME FOR TRANSPORTING LOGS FROM ONE WATER SYSTEM TO ANOTHER.

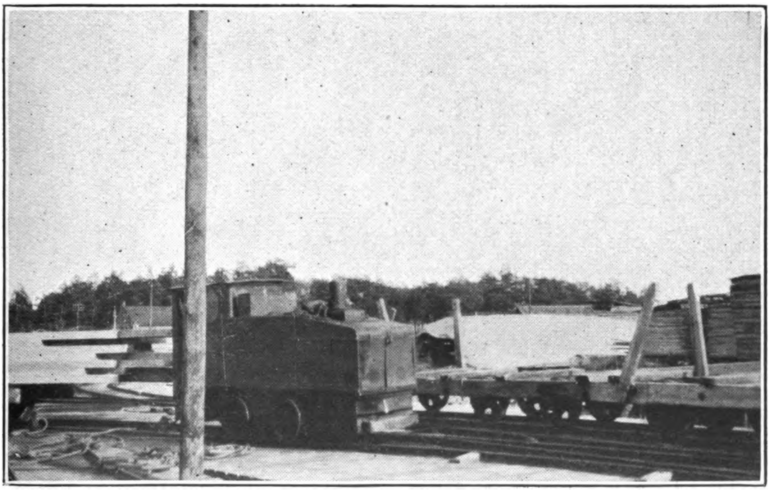

FIG. 24.—OIL-BURNING LOCOMOTIVE FOR TRANSPORTING LUMBER IN YARD.

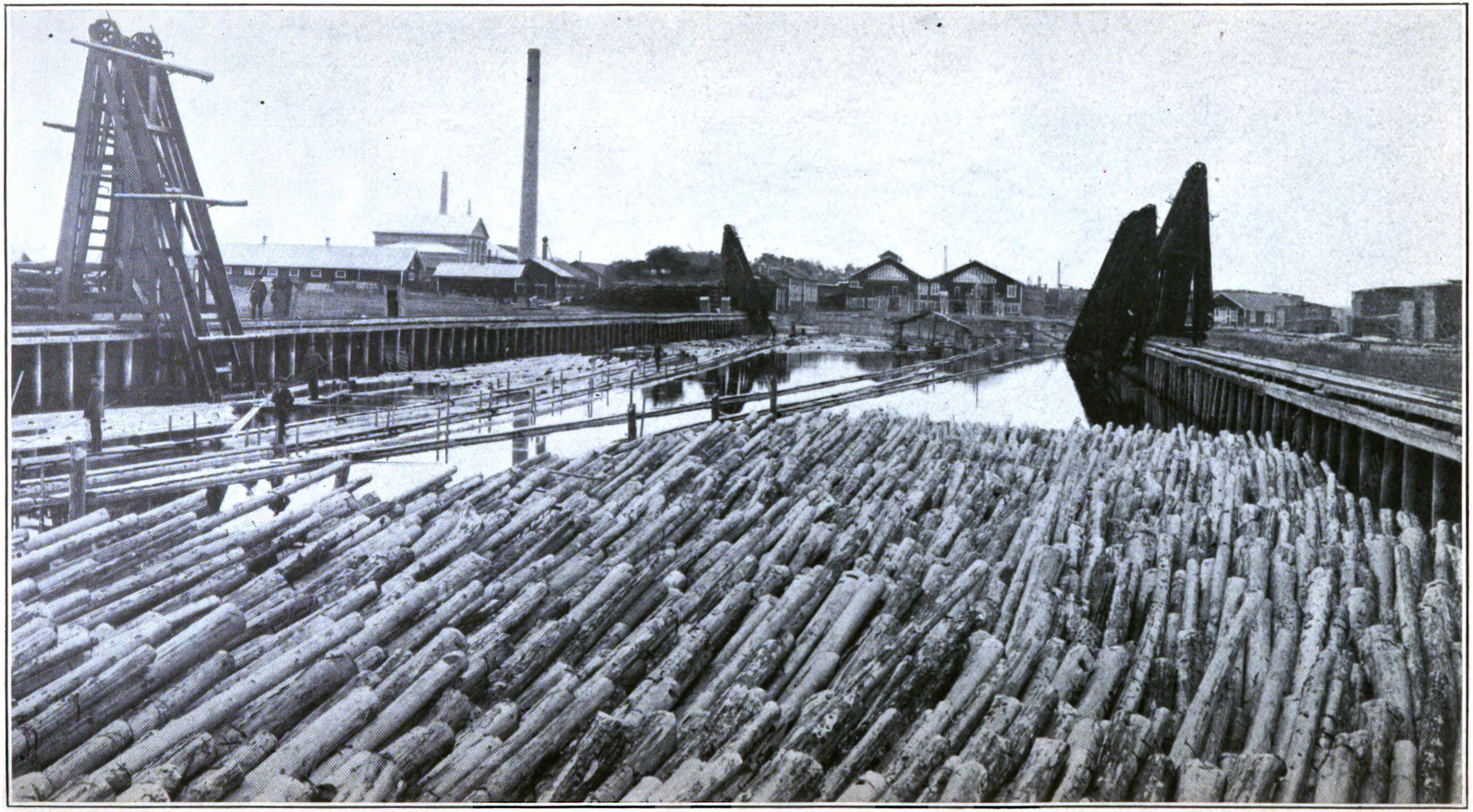

FIG. 25.—LOG ELEVATORS AND METHOD OF STORING LOGS.

cull lumber and low-grade construction lumber and pays for such stock about 10 per cent more than the export market pays for the unsorted grade, which is a superior quality.

The yard system is not developed as in the United States, and lumber is generally sold in small lots to local dealers in each district. Some of the larger mills may have a few yards, but they do not try to cover more territory than in the immediate vicinity of the mill. The export mills do not generally go in for domestic business, except in selling low-grade lumber for which there is no market abroad, and the domestic market is mainly supplied by small local mills.

ROUND, HEWN, AND SAWN TIMBER FOR EXPORT.

ROUND TIMBER.

Heavy timbers.—These were among the principal articles of export many years ago, but with the decreasing supply of virgin timber and the growth of the sawmill industry in Finland, the quantity of such timber for export is on the decrease, except in the northern parts, where special conditions prevail.

Masts.—Timber for masts must be about 70 feet and up and be 25 inches in diameter at 6½ feet from the butt and about 12⅝ inches at the top. The timber must be perfectly straight and no rot or any other serious defects are allowed. The supply of this material is now very limited in Finland.

Spars.—This stock is cut from 36 up to 80 or 90 feet in length, with a diameter of 7 to 16 inches, measured at the middle of the spar. The spars must be shipped the same year they are cut and must not have any knots which might weaken the piece.

This stock is used by shipyards for masts and ship rigging, construction work, etc. Spruce spars are preferred, but pine is also shipped.

Telegraph and telephone poles.—These are not very important in export trade. The poles are cut on the even feet up to 40 feet and after that generally on 5 feet. Telegraph and telephone poles must be free from bark, absolutely straight and sound, with no rotten knots, and the growth must be dense. Only one pole can be made from each tree.

Scaffolding, poles, boat hooks, etc., are mostly cut from spruce and are from 1 to 3½ inches in top diameter and from 16 to 40 feet in length.

Round mining timber is cut with a top diameter of 4 to 6 inches and lengths of 10 to 45 feet, average 17 to 18 feet. These timbers are used in the mines, and are not very important in the export trade of Finland. This stock is mostly supplied by Russia.

HEWN TIMBER.

Very small quantities of hewn timber are shipped from Finland, but it is claimed that the Finnish hewn timber is generally obtainable in longer lengths and is better hewn than Swedish stock.

The timber is given a conical shape and is cut from pine trees. The smallest size is 8 by 8 inches. The timbers are hewn square at the butt end and round at the top. The maximum lengths obtainable are 54 to 56 feet. A considerable amount of wane is permissible at the top end. The timbers must not be discolored, and if discolored a discount of 10 per cent in price is given. A certain amount of shakes may pass, but rot is not permissible.

The price per cubic foot increases about 2⅓ cents for each 6 feet in length. For instance, if timber 30 feet long costs 20 cents, 36-foot pieces would cost 22⅓ cents and 42 would cost 24⅔ cents per cubic foot. Before the war the price was generally $0.2025 per cubic foot, based on 30-foot timber, with the above-mentioned increase for longer lengths. Timbers holding in excess of 12 by 12 inches are seldom produced.

SMALL TIMBER.

The sizes vary from 3 by 3 up to and including 7 by 8 inches, the average being about 5 by 5 inches. Small timber is exported mainly from southwestern and southeastern Finland, the Viborg district being the principal producer of this stock.

Egypt is one of the largest markets for small timber and a special stock called Egyptian small timber is produced in large quantities. This stock is cut to the following dimensions: 3 by 3 inches, 3 by 4 inches, 4 by 4 inches, and 4 by 5 inches. The lengths run from 12 feet 6 inches to 25 feet. Pine is preferred.

This stock is hewn on all four sides, but may have a wane from the top extending through half of the length of the timber. At the butt end and at the middle the timber must hold the required measurements, but the top diameter may be one-half inch scant.

The quality of Egyptian small timber is inferior to other kinds of small timbers, but the prices are correspondingly lower. This stock is used for construction of native houses in Egypt. Both discoloration and a certain amount of rot are allowed and almost any amount of knots. Before the war the Egyptian small timber usually sold at 10 to 11 cents per cubic foot.

The prewar cost of production, per cubic foot, was usually as follows: Stumpage, 2 to 3 cents; cutting, 2 to 3 cents; hauling, 1 to 2 cents; transportation from forest to port, 1½ to 2½ cents; export duty and port dues, one-half cent; total cost, 7 to 11 cents. The average cost was approximately 8½ cents per cubic foot. The cost of production in 1918–19 was about 37¼ cents per cubic foot, and the selling price 48¼ cents per cubic foot.

Besides being shipped from the Viborg district these small timbers are also shipped from the Wasa and Raumo districts.

TIMBER FOR GERMAN AND DANISH CONSTRUCTION PURPOSES.

Timber for Germany and Denmark is cut to inch sizes from 4 by 4 to 12 by 12 inches. Lengths are 18 feet and up on odd and even feet. The average length is 22 to 23 feet for dimensions 4 by 4 up to 6 by 6 inches, 25 to 26 feet for dimensions 6 by 7 up to 8 by 8 inches, and 29 to 30 feet for timbers of larger dimensions.

These timbers must be perfectly straight, well hewn, and must hold the specified dimensions at the top, the middle, and at the butt end. Wane is allowed to extend through one-third of the length from the top.

The cost of producing this German and Danish stock before the war was about 10 to 20 per cent higher than for the Egyptian small timbers, on account of the more careful handling and cutting required. The selling price was about 14 to 17½ cents per cubic foot, which is considerably more than the price obtained for Egyptian small timbers, but the specifications of the German and Danish stocks are very strict. In 1918–19 the cost of production was approximately 57½ cents per cubic foot and the selling price 68 to 70 cents, the basis being 47 cents for small timbers 4 by 4 up to 6 by 6 inches, with an increase of 2¾ cents for 7 by 7 and 8 by 8 inches, and a similar increase for larger dimensions.

OTHER SMALL TIMBER.

Metric small timber.—The class of small timber called metric small timber is not as good as German and Danish timber, but better than Egyptian stock. Metric small timber is cut in length on the one-half meter and the pieces are generally from 6 to 8 meters long, but is hewn to conform to English measurement.

Sawn kantholz.—A special stock called "kantholz" was shipped to Germany before the war. This stock is sawn to centimeters and the dimensions run from 7½ by 7½ to 15 by 15 centimeters, with lengths from 6 feet up.

Almost any amount of wane is permissible, so long as it does not extend more than one-half the length of the piece, and the saw must cut on all four sides. On account of this wane the shippers claim that they gain about 25 per cent in cubical contents. In other words, in selling this stock, the exporters obtain payment for 75 per cent wood and 25 per cent air. The price paid before the war was approximately 16 cents per cubic foot.

Läkter.—A special stock called "läkter" is cut in lengths of 20, 22, 24, and 30 feet, holding 1¼ to 1¾ inches diameter. These timbers are hewn on only two sides. The bark must be removed. Before the war the cost of production was approximately 7½ to 9½ cents per timber and the selling price about 10½ to 11½ cents per timber. In 1918–19 the cost of production was 38 to 48 cents per timber and the selling price about 58 cents.

Railroad ties.—Russia has been practically the only market for railroad ties exported from Finland. They are produced to conform to the Russian railroad specifications.

Pulp wood.—The specifications vary greatly. Spruce is almost exclusively cut for this purpose, and the wood must be sound and not show any rot. The logs are carefully barked. The United Kingdom generally takes pulp wood in lengths of 6 feet and up with a minimum top diameter of 4 inches. France and Belgium require pulp wood of 10 centimeters as a minimum top diameter and lengths not to exceed 1 meter. Germany takes pulp wood in lengths of 1 meter and up. Lengths of 2 and 2½ meters are most in demand. The top diameter must not be less than 10 centimeters.

Props.—Large quantities of props are exported from Finland for use in the mines. There are two kinds of props—long and short. Long props are cut in lengths 10 feet and up, the average being 15 to 17 feet. The smallest top diameter is 3 inches. Long props are cut on the even feet. There is also some demand for props 8 feet and up in length, average 11 and 12 feet. Short props are cut in lengths from 2½ up to 8 feet. The lengths are cut on the quarter foot.

The length in feet must not be smaller than the top diameter in inches. For instance, props 2½ inches in top diameter must not be less than 2½ feet in length. For France the props are cut to metric lengths. The usual lengths are: 1, 1.10, 1.40, 1.50, 1.60, 1.80, 2, 2.20, 2.25, 2.50, 3, 4, and 4.40 meters, top diameters from 2½ inches to 8 or 9 inches. The props must be carefully trimmed at both ends and may be shipped either partly or entirely barked. Small quantities of birch props are also produced in 6 and 6½ foot lengths, top diameter 3 to 8 inches. Props may have any number of knots but must have no rot.

Pine and spruce props command the same price. Props are sold by the cubic fathom, which is equal to 216 cubic feet. Before the war the price was, on an average, $15.44 per cubic fathom and in 1918–19 approximately $67.55 per cubic fathom.

Firewood.—Any kind of wood is cut for firewood, but the top diameter must generally be not less than 2 inches. This stock is mostly shipped to Russia (Petrograd).

SPECIAL STOCK.

Hand-sawn lumber.—This stock is now almost a thing of the past, but it figured prominently in the lumber exports during previous years. It is sawed by peasants with hand saws and taken from the forests to the railroads and sold to local agents and exporters.

As logs from which such stock is cut are not floated, the lumber has better lasting qualities and is harder than if cut from floated stock. On account of these qualities, hand-sawn lumber has been in demand for shipbuilding, dock construction, etc. Eighty-five per cent of the hand-sawn lumber is cut 3 by 9 inches and about 15 per cent 3 by 8 inches. The usual length is 14 feet.

The principal market was Spain, where there is still some demand for hand-sawn lumber. There has also been a limited demand for this stock in France. The cost of producing hand-sawn lumber is now naturally very high and it is not believed that it can compete in the future with lumber cut by the sawmills.

Paving blocks.—No efforts have been made by the Finnish exporters to supply Finnish pine for paving blocks abroad, although there is no question but that a large percentage of Finnish split wood and planks is put to this use in foreign countries. Wood-block paving is rarely seen in Finland.

PRINCIPAL MARKETS FOR FINNISH LUMBER.

As Finnish pine and spruce lumber is similar to the Scandinavian products, it is, therefore, sold in about the same markets as Scandinavian lumber. The Finnish exporters have not been so enterprising in reaching faraway and oversea countries, because they have not had as satisfactory shipping facilities as Sweden and Norway, and have mainly limited their exports to the European countries.

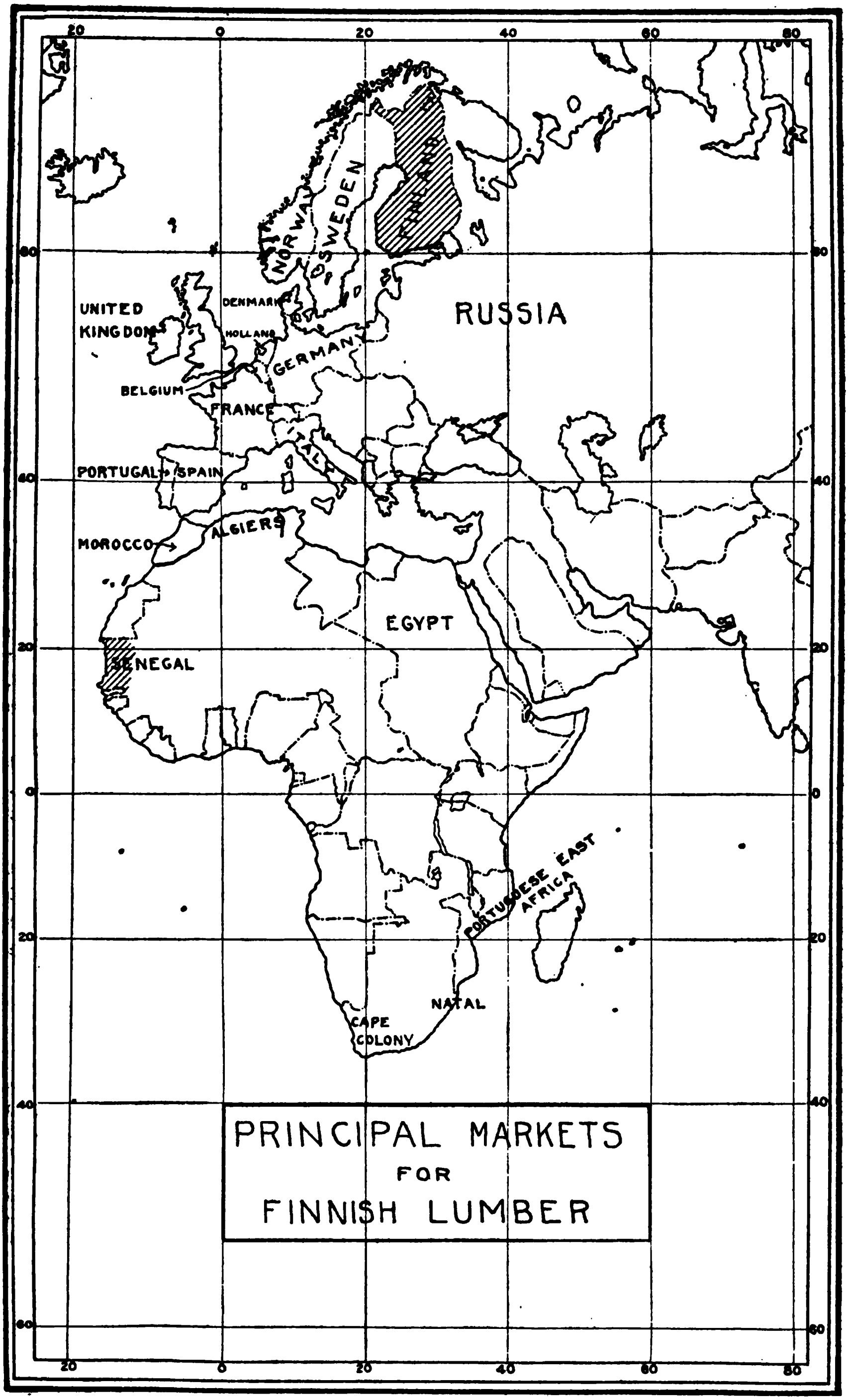

Fig. 26.—Principal markets for Finnish lumber.

Lately, however, the Finnish exporters have made energetic efforts to widen the scope of their activities. The exportation of planed lumber to many countries has been impossible, on account of heavy import duties placed on such stock.

Before the war the principal markets for Finnish lumber were the United Kingdom, France, Germany, Holland, Belgium, Spain and Portugal, Denmark, Russia, North Africa, and South Africa. Small quantities were also shipped to Norway and Sweden and a few other countries.

The stocks shipped to these markets are about the same as those shipped from the Scandinavian countries, but the quantity of planed lumber exported from Finland is very small, amounting to about 1 per cent of the total quantity of lumber exported.

UNITED KINGDOM.

To England and Ireland pine lumber is principally shipped, but Scotland takes large quantities of spruce. Almost all dimensions of lumber are shipped to the United Kingdom. The principal sizes in demand are the following: 4 by 7, 8, 9, and 11 inches; 3 by 4, 5, 7, 8, 9, and 11 inches; 2½ by 6, 6½, and 7 inches; 2 by 3, 3½, 4, 4½, 5, 6, 7, and 8 inches; 1½ by 6 and 7 inches; 1¼ by 6 and 7 inches; 1 by 4 inches and up; ⅝ by 3, 4, and 5 inches; laths, 3/16 by 1 inch by 4 feet; slating battens, ⅝, ¾, and 1 by 2½, 2, 1½, and 1¼ inches; cement staves, ½ by 28 by 2½ to 6 inches; heading, ½ by 17 by 3 to 7 inches, Scotland takes large quantities of 2½ by 6½ and 7 inch spruce battens, and Ireland is in the market for 11-inch boards. Long lengths are preferred in the United Kingdom.

The lumber is generally shipped from Finland to this market in the unsorted grade, but in many cases it is regraded by the importer. Some firms in Finland ship stock graded into different qualities to the United Kingdom and obtain very satisfactory prices.

The United Kingdom is the most important market for Finnish lumber, and the Finnish exporters have in the past sent important quantities of lumber to London on consignment. Some part of the lumber shipped to the United Kingdom is reexported to other countries.

The following specification gives an idea of a normal shipment to this market:

Pine, unsorted grade:	Board feet.
3 by 9 inches	149,000
3 by 8 inches	119,000
2½ by 7 inches	149,000
2 by 4½ inches	77,000
1½ by 6 inches	32,000
1¼ by 6 inches	50,000
Spruce, unsorted grade:	
2½ by 6 inches	99,000
2 by 6 inches	20,000
1¼ by 6 inches	20,000
2 by 4 inches	99,000
Total	814,000

Planed spruce lumber:	Board feet.
1 by 7 inches	495,000
1 by 6 inches	693,000
1 by 4½ inches	347,000
⅝ by 4¼ inches	50,000
¾ by 4½ inches	30,000
1 by 11 inches	69,000
Total	1,684,000

The United Kingdom takes large quantities of props, mining timber, pulp wood, small hewn and sawn timber, planed lumber, and almost the entire quantity of split wood exported from Finland.

FRANCE.

France takes mainly pine but also some quantities of spruce. The following dimensions are most in demand: 3 by 7, 8, $9\frac{1}{2}$, and 9 inches; $2\frac{1}{2}$ by 4, 5, 6, $6\frac{1}{2}$, and 7 inches; 2 by 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, and 5 inches; $1\frac{1}{2}$ by 5, $5\frac{1}{2}$, 6, 7, 8, and 9 inches; $1\frac{1}{4}$ by 5, $5\frac{1}{2}$, 6, 7, 8, and 9 inches; 1 by 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, $5\frac{1}{2}$, 6, 7, and 8 inches; $\frac{5}{8}$ by 3, $3\frac{1}{2}$, 4, $4\frac{1}{4}$, and 5 inches.

Northern France takes large quantities of boards. On account of the lax regulations for the building of houses, very waney lumber may be shipped to this market. The French importers frequently demand that Finnish lumber be graded according to their special instructions.

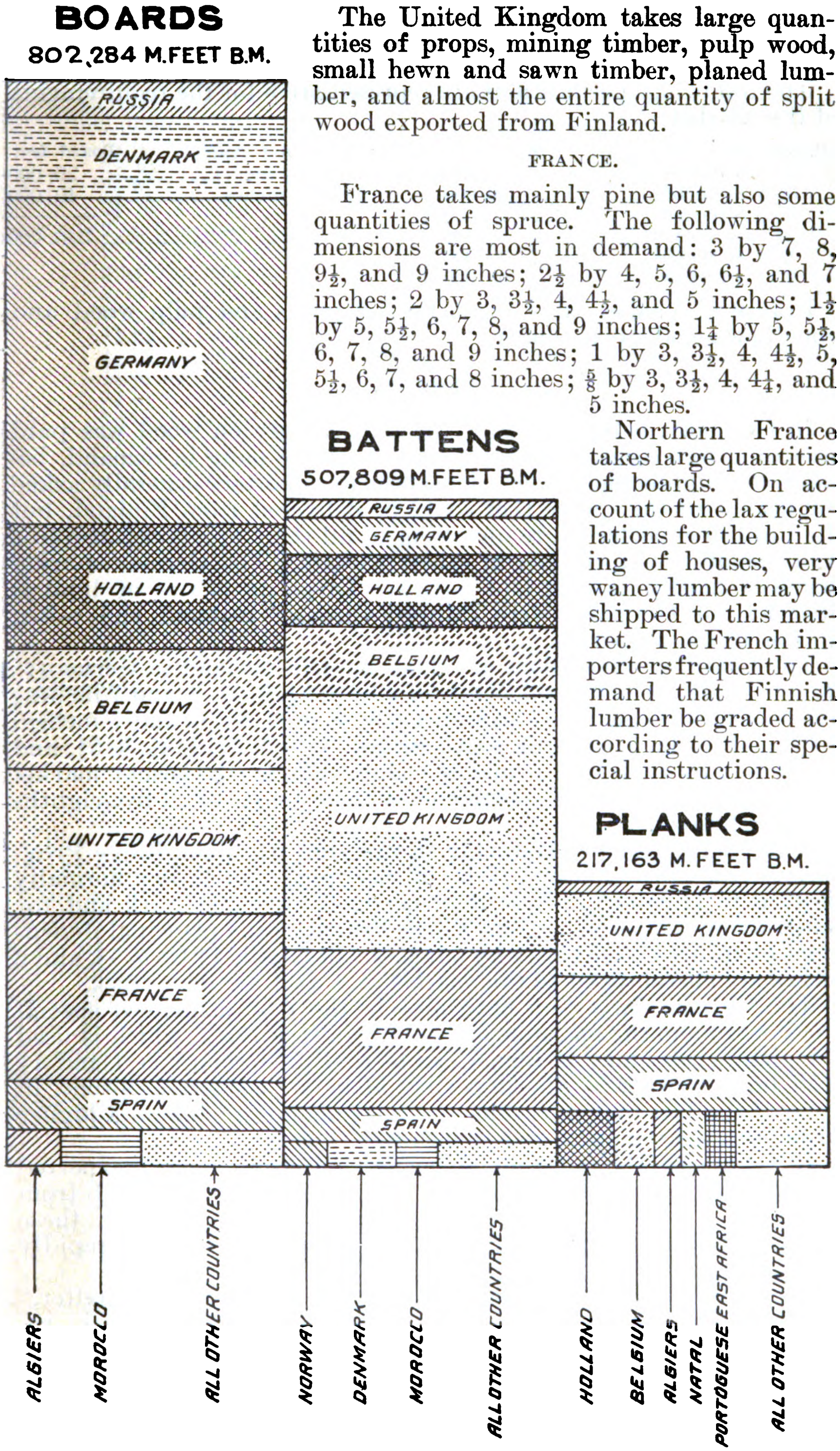

FIG. 27.—Exports of planks, battens, and boards, by countries of destination, in 1912.

Spruce stock 3 by 9 inches is very much in demand and used for joinery, furniture, etc. Long lengths are favored in France.

The following specifications are representative for the requirements of this market:

Spruce, unsorted grade:	Board feet.
3 by 9 inches	69,000
3 by 8½ inches	30,000
3 by 8 inches	20,000
1¼ by 5 inches	30,000
1 by 4½ inches	20,000
1 by 4 inches	99,000

Pine, unsorted grade:	Board feet.
1½ by 5½ inches	29,000
1¼ by 5 inches	49,000
Total	346,000

France also takes large quantities of props and pulp wood and some hewn and sawn timber.

GERMANY.

In Germany, before the war, the import duty on wood was paid according to weight, and spruce was therefore more in demand, because it is lighter than pine. The German importers generally asked for nearly all the spruce that could be delivered from Finland, but the Finnish exporters were unwilling to fill these orders because this would spoil the stock lists in other markets. The German market demands mostly battens and boards. Large quantities of lumber destined for Germany were shipped through Holland and taken up the Rhine on barges.

The following dimensions are those most in demand in Germany: 2½ by 4, 4½, 5, 5½, 6, 6½, and 7 inches; 2 by 4, 4½, 5, 5½, 6, and 7 inches; 1½ by 4, 4½, 5, 5½, 6, and 7 inches; 1¼ by 4, 4½, 5, 5½, 6, and 7 inches; 1 by 3, 3½, 4, 4½, 5, 5½, 6, 6½, and 7 inches; ¾ by 3, 3½, 4, 4½, 5, 5½, and 6 inches; ⅝ by 3, 3½, 4, 4½, 5, and 5½ inches. The north German market takes large quantities of spruce boards three-fourths and five-eighths of an inch thick.

As a whole, northern Germany favors pine, while the Rhine Provinces favor spruce. Some 3 by 9 inch pine planks are normally shipped to Hamburg, where they are used for canal work and for construction purposes. In the Rhine Provinces the principal dimensions of spruce battens are 2 by 6 inches, but boards 1¾ by 5, 5½, and 6 inches are also shipped to this market and used for door stock.

The German importers have also in the past demanded special stock seven-eighths and nine-eighths of an inch thick, which is used for planing, but may in some cases be sold in Germany as 1 and 1¼ inch lumber, whereby the importers make a considerable profit, in spite of the fact that such dimensions command in Finland a higher price than the regular 1 and 1¼ inch stock sizes.

In years past Hamburg and a few other German ports reexported considerable quantities of planks of long lengths imported from Finland. The Finnish exporters, however, tried to reach these markets themselves and this reexport business decreased very rapidly before the war.

Germany also takes special waney stock, called "schaalbretter," which is used for packing boxes. These boards are from slabs resawn into thin stock. Almost any defect is allowed, so long as the saw has cut on all four sides of the piece. Lumber of the upper grades is taken from Russia and Sweden.

As typical specifications for the north German and Rhine markets the following statement is given:

North German market:	Board feet.
Pine, unsorted grade—	
2½ by 5½ inches	59,000
2½ by 5 inches	59,000
2½ by 4½ inches	4,000
2½ by 4 inches	4,000
2 by 6 inches	20,000
2 by 5½ inches	63,000
2 by 5 inches	99,000
2 by 4½ inches	40,000
2 by 4 inches	79,000
1½ by 5½ inches	10,000
1½ by 5 inches	10,000
1½ by 4½ inches	10,000
1¼ by 6 inches	4,000
1¼ by 5½ inches	20,000
1¼ by 5 inches	10,000
1 by 7 inches	10,000
1 by 6½ inches	20,000
1 by 6 inches	20,000
1 by 5½ inches	40,000
1 by 5 inches	99,000
1 by 4½ inches	99,000
1 by 4 inches	79,000
1 by 3½ inches	20,000
1 by 3 inches	20,000
⅝ by 5½ inches	40,000
North German market—Con.	Bd. ft.
Spruce, unsorted grade—	
⅝ by 5 inches	99,000
⅝ by 4½ inches	49,000
⅝ by 4 inches	49,000
⅝ by 3 inches	10,000
¾ by 6 inches	10,000
¾ by 5½ inches	40,000
¾ by 5 inches	79,000
¾ by 4½ inches	30,000
¾ by 4 inches	49,000
¾ by 3½ inches	20,000
¾ by 3 inches	20,000
Total	1,393,000
Rhine market:	
Spruce, unsorted grade—	
3 by 7 inches	198,000
2½ by 7 inches	347,000
2½ by 6 inches	99,000
2 by 7 inches	297,000
2 by 6 inches	594,000
1½ by 5 inches	59,000
1 by 6 inches	79,000
Total	1,673,000

Germany was, prior to the war, one of the largest markets for hewn and sawn timber and also imported large quantities of props, pulp wood, and staves from Finland.

NETHERLANDS.

The Netherlands demands large quantities of spruce lumber in thicknesses of ¾, ⅞, 1, 1¼, 1½, 2, 2½, and 3 inches. Widths of 7 and 8 inches are most in demand. Spruce battens are mainly shipped in sizes of 2½ by 6 and 6½ inches. Pine lumber is chiefly taken in sizes of 1¼ and 1½ by 8 inches and 2½ by 6½ inches. The Netherlands does not import any large quantities of planks, but takes special stock such as nine-eighths and seven-eighths inch lumber for planing. This is practically the only market in Europe, besides the United Kingdom, that imports Finnish planed lumber. This market also takes telegraph poles, pulp wood, and limited quantities of timber, props, split wood, and staves.

BELGIUM.

To Belgium mostly battens and boards are shipped and very small quantities of planks. This market generally takes the cheaper qualities of Finnish lumber, such as the better class of cull and discolored stock. The dimensions required are about the same as those used by Germany. Large quantities of "schaalbretter" in thicknesses of three-fourths and five-eighths of an inch are shipped and used for packing cases for glassware. The favored dimensions of such stock are ¾ by 4½ inches.

The following is a typical pine specification for the Belgium market:

Unsorted grade:	Board feet.
2½ by 7 inches	238,000
2½ by 6½ inches	218,000
2½ by 6 inches	158,000
1 by 5½ inches	30.000
1 by 5 inches	59,000
1 by 4½ inches	119,000
1 by 4 inches	139,000
Cull: ¾ by 4½ inches	100,000
Total	1,061,000

Belgium also takes cement staves, props, and small quantities of pulp wood and split wood.

SPAIN AND PORTUGAL.

Spain takes a great variety of dimensions. Pine stock is generally preferred. Planks 3 by 9 inches and 4 by 9 inches are much in demand as are also 1½-inch boards. The Seville market has, in the past, demanded special stock such as 1½ by 11 inches, 12 feet long. Before the war hand-sawn lumber was exported in considerable quantities to Spain.

Spain favors short lengths, 12 and 14 feet. This market is very conservative, and it is difficult to get the importers to change their specifications to conform to the wishes of the exporter. Very satisfactory prices are usually obtained in the Spanish market.

The following specifications covering a shipment of pine, unsorted grade, is representative for the south Spanish market:

	Board feet.
3 by 9 inches	238,000
3 by 8 inches	40,000
2 by 8 inches	40,000
1½ by 8 inches	20,000
1 by 8 inches	20,000
¾ by 8 inches	20,000
3 by 7 inches	20,000
2½ by 7 inches	20,000
2 by 7 inches	20,000
1½ by 7 inches	20,000
¾ by 7 inches	20,000
4 by 6½ inches	40,000
3 by 6½ inches	40,000
2½ by 6 inches	40,000
3 by 6 inches	59,000
2 by 6 inches	59,000
1½ by 6 inches	59,000
1¼ by 6 inches	20,000
1 by 6 inches	59,000
¾ by 6 inches	40,000
1 by 5 inches	20,000
¾ by 5 inches	20,000
3 by 4½ inches	20,000
3 by 4 inches	20,000
1½ by 4 inches	20,000
3 by 3 inches	20,000
2 by 3 inches	40,000
1½ by 3 inches	40,000
Total	1,094,000

Some quantities of pulp wood and of hewn and sawn timbers are exported to this market.

Portugal is a limited market for Finnish lumber, and the principal demand is for pine planks 3 by 8 inches and up and small quantities of battens.

DENMARK.

Pine stock is favored by Denmark. Boards are the principal item imported, with small quantities of battens and planks.

Denmark favors wide stock and often gives special instructions in regard to the grading. The usual dimensions are 1, 1¼, and 1½ inches in thickness and 6 and 7 inches in width. Low-grade boards in thicknesses of ⅝, ¾, and 1 inch and widths of 4, 4½, 5, and 5½ inches are in great demand. The better grades of boards are taken in widths up to 11 inches. Battens are taken in sizes of 2 and 2½ by 5 inches. The Danish market does not require long lengths, but takes large quantities of 12 and 14 foot stock. Some props, hewn and sawn small timbers, split wood, and staves are also exported to this market.

RUSSIA.

Statistics show that large quantities of logs, props, pulp wood, firewood, railroad ties, and considerable quantities of planks, battens, and boards were shipped to Russia before the war. These shipments give a wrong impression of the importance of the Russian market, if one does not take into consideration that a great many Finnish exporters shipped through the port of Petrograd. The fact that export duty, before the war, was not levied on wood products exported to Russia was an inducement for Finnish shippers to export their lumber through Russian ports, and it is safe to assume that probably the largest part of the lumber shipped to Russia was destined for other countries, as the Russian Baltic Provinces are large producers and exporters of lumber. Petrograd, however, has been an important market for firewood.

NORWAY.

Before the war Norway imported some Finnish battens and boards. Although part of this lumber was for the needs of the country itself, the majority was probably imported to be planed in Norway and then reexported to other markets. Finland has also shipped to Norway large quantities of split wood, which is used for the manufacture of box shooks for reexportation. Norway also takes large quantities of pulp wood and small quantities of props and staves. The reasons for the importation of Finnish lumber into this market have been that Finnish lumber, in the past, was much cheaper than Norwegian lumber, and the Norwegian exporters had better shipping facilities, as Norway can ship lumber the year around, obtaining better prices during the time when navigation is closed in the Baltic regions of Finland, Sweden, and Russia.

SWEDEN.

Sweden takes limited quantities of lumber but large quantities of sawlogs from Finland. The exportation of sawlogs to Sweden has been bitterly opposed by the Finnish lumbermen. They contend that this export of sawlogs not only deprives Finland of large amounts of wages that would be paid to Finnish workmen if these logs were sawed into lumber in Finland, but also that Swedish lumber cut from these logs enters into direct competition with Finnish lumber in foreign markets.

The Swedish mills take logs from the Finnish State forests in northern Finland, and as these logs are usually of heavy dimensions the Swedish exporters are able to complete their stock lists with wide dimensions produced from Finnish logs and thereby realize a better average price for their total output. The Swedish forests are unable to produce large quantities of wide stock.

Although many of the Finnish mills in the northernmost shipping districts cut their lumber equally as well as the Swedish mills, the Finnish exporters usually receive from $1.23 to $1.84 per thousand feet less than the mills in northern Sweden.'

The export of sawlogs from Finland to Sweden from 1891 to 1916 is given in the following statement:

	Cubic feet.		Cubic feet.
1891	832, 000	1904	3, 140, 000
1892	958, 000	1905	3, 174, 000
1893	1, 621, 000	1906	3, 514, 000
1894	1, 359, 000	1907	6, 333, 000
1895	2, 254, 000	1908	8, 289, 000
1896	3, 366, 000	1909	8, 279, 000
1897	5, 573, 000	1910	13, 328, 000
1898	5, 181, 000	1911	14, 138, 000
1899	3, 126, 000	1912	13, 932, 000
1900	4, 598, 000	1913	14, 179, 000
1901	4, 352, 000	1914	14, 530, 000
1902	3, 466, 000	1915	9, 439, 000
1903	4, 838, 000	1916	14, 573, 000

The Finnish Government has favored this export of logs, because the Swedish bids for timber in the State forests have created a keener competition, thereby increasing the prices of Government saw timber.

OTHER EUROPEAN MARKETS.

Very small quantities of lumber have been shipped to other European markets. Italy has taken small amounts of hewn small timber, but no lumber. Lack of shipping facilities from Finland has prevented the Finnish exporters from going into the other Mediterranean countries in Europe.

NORTH AFRICA.

Egypt is the principal market for Finnish small hewn timber. Other North African markets are growing, but the Finnish lumbermen have not been able to get a large share of this trade as yet. The Canary Islands take limited quantities of staves and planed lumber (box shooks). If Finland should obtain better steamship connections with these markets, it is expected that the trade would grow very materially.

SOUTH AFRICA.

The stock exported to South Africa is about the same as that shipped from Sweden and Norway, mostly planks 3 by 9 inches. Long lengths are preferred and pine stock is favored. These South African markets often call for lengths 22 feet and up. Lengths less than 16 feet are seldom shipped. Limited quantities of battens and boards are also taken. The principal battens dimensions are 2 by 3 inches, 3 by 3 inches, 3 by 4 inches, 3 by 4½ inches, and 3 by 6 inches.

Some planed lumber is exported to Cape Colony, Natal, and Portuguese East Africa. Senegal, on the western coast, is a new market, taking small quantities of planks. South African shipments have been made in whole cargo lots.

ASIA.

With the exception of small quantities of props to Asia Minor and limited quantities of staves exported to China, no important direct shipments of Finnish lumber or timber have found their way to Asia.

DOMESTIC MARKET.

The domestic prices are not regulated by the association. Large quantities of planed and rough lumber have recently been sold for reconstruction purposes in Finland and the planing charges have generally been about 50.50 marks ($9.75 par value) per thousand feet board measure. Planed cull lumber is sold locally at approximately 50.50 marks per thousand feet board measure below the price of unsorted grade for export.

The domestic prices of rough lumber were, during the early part of 1919, about 15 to 20 per cent higher than for export.

BRANDING.

The system of branding is the same as used in Sweden.[1] Many Finnish firms have branded their lumber for half a century. Generally each piece of lumber, except culls, is branded. The cost of branding, under normal conditions, does not exceed 8 to 10 cents per thousand board feet and in many cases is less.

Following are some of the Finnish brands for various grades of pine and spruce lumber:

KOTKA SHIPPERS' BRANDS.

First grade	W ♛ G
Second grade	W ★ R
Third grade	W + S
Unsorted grade	W G + R
Discolored stock	W + G

VIBORG SHIPPERS' BRANDS.

First grade	H ♛ Cº
Second grade	H + Cº
Third grade	H — Cº
Fourth grade	H H H H
Unsorted grade	H ● Cº

SHIPPING.

When the lumber is ready for shipment it is taken from the yard to the dock on automatic conveyors of about the same construction as in Scandinavia or loaded on trucks and hauled to the dock.

At the end of the dock there is generally a trimming shed with saws operated by electricity and movable along the dock on a spur. Some of the less efficiently operated mills have not installed electric power in their trimming sheds and have the trimming done by hand.

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[1] See "Swedish Forests, Lumber Industry, and Lumber Export Trade," pp. 228-281.

TRIMMING TO UNIFORM LENGTHS.

In trimming the lumber a small excess is given, usually from ½ to 1 inch. While the lumber is sawed to English standards of measurement, it may be trimmed to any standard desired (English, metric, Danish, Spanish, German, etc.), because this process is very simple and only requires the changing of the measuring rods attached to the trimming table. The butt end of each piece is first slightly touched by the saw, in order to give it a good appearance, then the length of the piece is marked off at the other end and the piece is trimmed to odd or even feet. The trimming saws have a great many teeth and the cut is very smooth, thereby giving the lumber a good appearance and at the same time facilitating the stenciling of the brand.

The mill ends are carefully retrimmed and put up in lengths varying from 6 inches or 1 foot as a minimum up to 5½ feet as a maximum. This stock is trimmed on the one-half foot and is called split wood. It is piled solid and covered with a roof. Mill ends less than 6 inches long are usually sold as firewood.

From the trimming shed the lumber is dumped into the barge on a chute. Some firms are so careful in handling the stock that they use a mat made of rope at the end of the chute to protect the ends of the pieces. On the barge the lumber is branded by boys. Great care is taken to put the stencil marks on neatly, and for practically every dimension there is a separate stencil which covers the entire surface of the end. Lumber may be branded at one or both ends.

LOADING ON VESSELS.

In most cases the trimming shed extends over the dock so that lumber may be taken on board the barges irrespective of weather conditions. The barges are usually covered with a roof and have walls on three sides or are otherwise protected in case of rain. The loaded barges are towed out to the steamer and the lumber is taken on board, the transfer being made from barges on both sides of the ship. There are no mechanical devices for loading lumber. On an average 150,000 to 250,000 board feet of lumber may be loaded per day.

The bill of lading signed by the master of the ship certifies to the number of pieces taken on board, but no receipt is given by the ship covering the quantity or quality of the cargo. Most of the cargoes are sold on a f. a. s. (free alongside of steamer) basis or f. o. b. (free on board), and when the bill of lading is signed by the master of the ship the responsibility of the shipper ceases. Spruce, discolored, and cull lumber is usually loaded on deck. Spruce is less damaged by sea water than pine lumber. Manila ropes or covered chains are used whenever possible in taking the lumber on board.

Mills in the interior must ship their lumber to the ports by rail or by barges and must make special arrangements for storing it at the port of shipment. The barges usually carry about 200,000 board feet of lumber and cost from $1,100 to $1,500 before the war. The railroad cars have a capacity of 5,000 to 6,000 feet.

TRANSPORTATION TO SEAPORTS.

Since the revolution in 1918, there has been a scarcity of rolling stock in Finnish railways, because the retiring Bolsheviks removed a great many of the freight cars and locomotives to Russia. The traffic from the interior mills to the ports of shipment is considerable. In 1914 about 175,000,000 board feet of lumber were transported through the canals of Finland, and in 1913 approximately 361,000,000 feet. More than half of this quantity was transported on the Saima Canal in the Viborg district. Through the Saima Canal barges up to 102 feet long and of 7 feet 10 inches draft can pass. The canal is closed by ice from the beginning of November until May.

The present railroad freight rates are much higher than the prewar rates. From Kajana to Kotka, a distance of 306 miles, the rates before the war were from $3.85 to $4.65 per thousand feet, board measure, and in 1918 were about $15.50 (at par value of the mark). The freight from Kuopio to Kotka, a distance of 201 miles, was about $2.25 per thousand feet in 1913–14 and about $9.75 in 1918–19. The increase of the freight rates in the other districts of Finland is in about the same proportion.

In some of the shipping ports, there are concerns making a specialty of storing and shipping lumber for export from interior mills. The storage charges before the war were generally figured at $1 to $1.50 per thousand board feet, but they increased about 250 per cent in 1918.

There is under consideration a project to construct a canal connecting Ladoga Lake and the Gulf of Finland, with the entrance to the canal near the city of Viborg. It is planned to make the canal large enough for ships up to 1,000 register tons. If such a project should be realized, the Finnish mills on Ladoga Lake that have previously shipped via Petrograd at a great expense could have steamers load right at the mills. This canal would be of great importance to lumber industries in that part of Finland, as it would permit the exploitation of large forest areas in eastern Finland and western Russia.

A few Finnish mills maintained yards in Petrograd previous to the war and towed their lumber from the northern and eastern shores of Ladoga Lake to Petrograd. The cost of such towage (including transfer across the lake) was from $3 to $4 per thousand feet, board measure.

INSPECTION OF LUMBER.

The importers abroad do not maintain any inspection service in connection with shipments of lumber from Finland. As all lumber is branded, indicating the quality and origin of each piece, it is a simple matter to ascertain whether the lumber has been shipped according to specifications. Justified claims can not be disregarded by reputable exporters, because such procedure would injure their standing. Therefore the inspection of lumber before shipment is uncalled for in Finland, particularly since the importers do not generally pay for the lumber before it has been received.

In the Russian shipping districts on the Baltic and the Gulf of Finland the inspection of lumber before shipment is in many cases necessary, on account of the unsatisfactory methods often practiced by exporters in these districts.

It is understood that such inspection is not necessary in regard to shipments of Finnish lumber made through these ports.

DIRECT STEAMSHIP LINES.

The lumber exporters in Finland have not been especially favored by direct steamship lines between Finland and foreign countries. Before the war there were only a few direct steamship lines connecting Finland with Germany, the United Kingdom, Holland, France, and some other countries. In the future it is believed that new steamship lines will be established, but these connections may not be of great importance to the lumber export trade, because the liners would likely be unwilling to go out of their way to load at mills distant from the principal ports of call. The ports which will be most benefited by direct steamship lines in the future will be Abo, Hango, and Helsingfors, and possibly Mantyluoto (near Bjorneborg).

During the war some quantities of lumber were shipped by barge across the Bay of Bothnia to Lulea, in northern Sweden, and from that port shipped by rail to the Norwegian west-coast port of Narvik. From this port shipment was by steamer to the United Kingdom. It is not thought that this transportation route will be of any importance in the future, because it was simply a war measure and involved heavy expenses.

Only insignificant quantities of lumber were shipped during the war, and it was not until the shipping season of 1919 that any considerable amounts were moved.

Most of the Finnish lumber has been shipped in full cargo lots and only insignificant quantities in parcel lots on regular liners. Finnish lumber has nearly always been sold on a f. o. b. basis, but a change in this regard may be expected in the future, as the Finns realize that they can obtain better prices if able to sell on a c. i. f. basis. In the past the Finnish exporters have greatly neglected the transportation question and left this matter to the importers.

There is hardly a mill in Finland that possesses its own boats, with the exception of a few small vessels. The Finnish exporters have contended that they are too far away from the principal shipping centers of Europe to follow the freight market and that the importer can attend to the freight question much better than the exporters. This point of view is very different from that taken by the Norwegian exporters, who have specialized in c. i. f. quotations for decades. The Norwegian exporters have, therefore, been able to sell their lumber to better advantage and have reached markets where the Finns have been unable to sell.

OCEAN FREIGHT RATES.

Before the war, the usual freight rates, per 1,000 board feet, from ports in southern and southwestern Finland, were as follows:

Denmark	$2.73–$3.10
United Kingdom, east coast	3.08– 3.45
United Kingdom, west coast	4.31– 7.68
French channel ports	3.50– 4.05
French Bay of Biscay ports	4.25– 4.44
Holland	3.50– 4.05
Belgium	3.50– 4.05
Spain, north coast	4.44– 4.83
Spain, Mediterranean ports	5.40– 7.72
Germany, Baltic ports	2.75– 2.90
Germany, North Sea ports	3.50
North Africa	5.40– 8.00
South Africa	10.00–10.50

From the northern ports in Finland an additional freight charge of $0.61 to $1.23 per 1,000 feet was usually demanded, mainly on account of the difficulty of obtaining cargoes for these ports, so that the ships had to go up in ballast. The unsatisfactory harbor conditions in some of these northern ports also increased the freight rates. The rates were higher toward the close of the shipping season on account of the danger from ice, storms, etc.

The marine insurance rates were about the same as the rates in Sweden. Short lumber (6, 7, and 8 feet) was taken at two-thirds of the regular freight rates in a quantity not exceeding 3 to 5 per cent of the cargo, but for any greater amount full freight had to be paid. Deck cargoes would at times be carried at two-thirds of the rate for underdeck cargo.

The freight rates in September, 1919, for steamer cargoes from southern Finland to the eastern coast of the United Kingdom were from 200 to 205 shillings per Petrograd standard, which is $24.55 to $25.17 per thousand board feet.

From northern Finland an increase of 15 shillings per Petrograd standard, or $1.85 per 1,000 feet, was charged.

SHIPPING SEASON.

The shipping season in Finland is limited to the time the ports are free from ice. In northern Finland the shipping season starts at the end of May and lasts until the beginning of November, and on the southern coast it starts about at the beginning of April and lasts until about the middle of December. The shipping period varies from year to year in the different ports. Some favorably located ports on the southern coast may be able to extend the shipping period until the beginning or middle of January. The season thus varies from five months in the north to eight months in the south.

The following statement shows the export of lumber during the different months of the year:

	Per cent.		Per cent.
January–May	8.2	September	15.5
June	13.8	October	13.3
July	20.0	November	8.6
August	16.2	December	4.4

There are a few ports on the southwestern coast which are kept open the year around by ice breakers, but these ports are unimportant to the lumber export trade. In some years the port of Helsingfors is also kept open the entire year.

The ports in Finland are generally good, except in certain sections of northern Finland, where boats must load off the coast on account of unsatisfactory harbor conditions.

SHIPPING DISTRICTS.

The lumber exported from Finland is shipped from 11 principal shipping districts in Finland and one district in Russia (Petrograd). The location of these shipping districts is designated on the map accompanying this report and, from north to south, the names are as follows:

Tornea and Kemi district.
Uleaborg and Brahestad district.
Gamla Karleby, Jakostad, and Ny Karleby district.
Wasa and Christianstad district.
Bjorneborg and Raumo district.
Abo (including Aland Islands) district.
Hango and Ekenas district.
Helsingfors, Borga, and Lovisa district.
Kotka district.
Fredrikshamn district.
Viborg district.
Petrograd district.

TORNEA-KEMI DISTRICT AND ULEABORG-BRAHESTAD DISTRICT.

These districts are very much alike in regard to the quality of the lumber exported. The pine lumber from this part of Finland is noted for its excellent qualities. The color is reddish, and the wood contains a large percentage of heartwood. The texture is very solid and dense. However, the lumber is very knotty, particularly if cut from timber grown in the coastal districts. On account of its solid texture and lasting qualities, this lumber is especially adapted for shipbuilding, dock construction, etc. The spruce in this part of Finland is not equally good.

The percentage of cull logs is larger than in other parts of the country, because the interior forests consist mainly of large stands of overmature trees. These trees are likely to show rot and decay, because the heavy snowfalls in the winter cause the branches to break and water gets in through the knotholes. The lumber from these districts is too knotty to be graded into more than two grades, and the wood does not lend itself for planing purposes for the same reasons.

The lumber produced in these sections is in special favor with the British and French buyers. It is also exported to Holland, Spain, and other countries.

In the ports of Uleaborg, Kemi, and Tornea sawmills of a large capacity are found. Their stocks are rated among the very best in Finland, and the percentage of wide sizes and long lengths is greater than obtainable in any other section of the country. The mills in the Brahestad section do not come up to the standard of the mills in other parts of the districts.

All these districts produce large quantities of charcoal, timber, props, and pulp wood for export. The export of timber consists mainly of sawlogs, which are rafted across the Bay of Bothnia to Sweden. These districts have not had any pulp and paper mills, but large pulp mills are now under construction, and it is expected that they will consume a great deal of the pulp wood and props that heretofore have been exported.

These northern shipping districts will probably show the greatest expansion in export trade in the future, because the supply of raw material is very large. The shipping season is short in this part of Finland. In Tornea navigation is open from the end of May until the end of October; in Kemi, from the end of May to the beginning of November; in Uleaborg, from the end of May to the middle of November; and in Brahestad from the latter part of May to the end of November.

GAMLA KARLEBY, JAKOBSTAD, AND NY KARLEBY DISTRICT.

This district is not important and the lumber shipments are made up from a great many small mills in this territory. The chief exports are props, pulp wood, and some charcoal. A very small quantity of planed lumber is shipped from Jakobstad.

The facilities for loading are often unsatisfactory in these districts. Navigation is open in Gamla Karleby from about the middle of May until the end of November; in Jakobstad, from the middle of May until about the middle of November; and in Ny Karleby, from the middle of June until the middle of October.

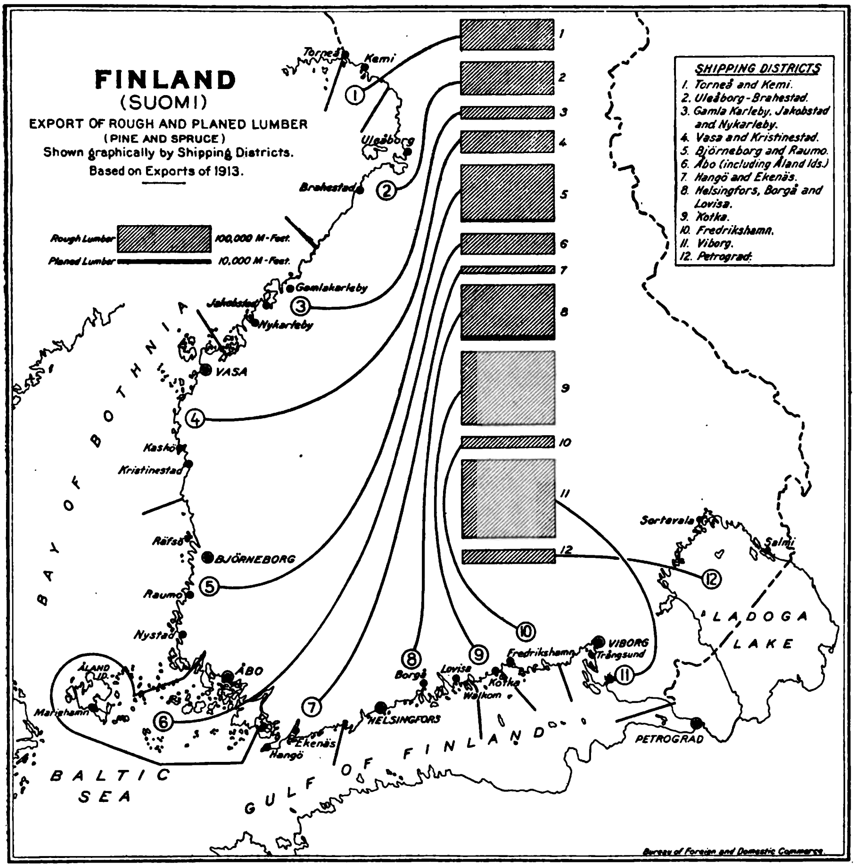

FIG. 28.—Exports of pine and spruce lumber, by shipping districts, in 1913.

WASA AND CHRISTIANSTAD DISTRICT.

This district is in many respects similar to the Gamla Karleby district, although more important for the shipment of lumber. There are a great many small mills in the district and the quality of their output varies a great deal. Props and pulp wood constitute the principal kinds of wood exported.

Navigation generally opens at the beginning of May and closes at the end of December.

BJORNEBORG AND RAUMO DISTRICT.

This district is among the most important in Finland, and the mills engaged in the export business are large and efficiently operated. The lumber shipments from Bjorneborg and Raumo, together with those from Tornea, Kemi, and Uleaborg, and from the Kotka district, constitute the best Finnish shipments.

In these districts are two companies that accumulated enormous stocks during the war—one company having at one time approximately 250,000,000 board feet stored in Bjorneborg and another company having about 275,000,000 feet stored in various places in Finland, but large quantities in the Bjorneborg district.

Some of the mills in this district possess extensive virgin timber holdings that yield a larger percentage of the higher grades than are found elsewhere in Finland. It has, therefore, been found profitable for some of these mills to grade their lumber into four or five qualities of pine lumber and two qualities of spruce. The average percentage of the different grades is as follows: Pine lumber—first quality, 8 to 20 per cent; second quality, 23 to 30 per cent; third quality, 32 to 45 per cent; fourth quality, 15 to 19 per cent; spruce lumber—first quality, 82 to 85 per cent; second quality, 15 to 18 per cent.

The percentage of cull lumber varies a great deal, but this kind is seldom exported in large quantities. The average lengths of the lumber shipped is longer than in most of the other southwestern districts and varies from 14 to 17 feet for boards, 16 to 17 feet for battens, and from 17 to 18 feet for planks.

One mill in this district rafts timber from northern Finland, and nearly all the other mills get part of their log supply from the near-by coastal districts, even as far north as Wasa. Limited quantities of logs are also taken from the Aland Islands, off the southwestern coast. This timber, however, is very knotty. Spruce lumber from the Bjorneborg and Raumo district has an excellent reputation for quality in the European markets. Prior to the war, important quantities of pulp wood, props, and hewn timber were exported and also some small timber and charcoal.

The planing mill industry and the box industry have recently been started and promise a great deal for the future on account of the better class of raw material for the planing mill industry found in these regions than in other parts of the country.

ABO DISTRICT.

This district differs in many respects from the Bjorneborg and Raumo district. The mills are generally small and the lumber produced varies a great deal in quality. Short lengths characterize the output of these mills, and large stocks of 14-foot lumber are produced. Such stock has, for a long time, found a ready market in Spain.

Timber cut in the coastal regions is generally knotty and of small dimensions, and the lumber produced does not come up to the average in percentage of wide stock. On account of the lack of uniformity in the output, the prices obtained for Abo district shipments are somewhat below those paid for lumber shipped from other districts in Finland. Props, pulp wood, and small timber are exported to some extent from this district.

The port of Abo is generally kept open the year around by ice-breakers, but the other shipping points in this district can ship only from the middle of April to the end of December. The port of Mariehamn, on the Aland Islands, figures to a small extent in the lumber export trade. Limited quantities of firewood, and props and about 2,000 thousand board feet of lumber are exported from this port annually.

HANGO AND EKENAS DISTRICT.

Although very few mills are found in this district, the port of Hango exports some lumber originating from interior mills. This port is generally kept open the year around.

From Ekenas practically no rough lumber is shipped, but limited quantities of timber, props, pulp wood, and a small quantity of planed lumber are exported.

The port of Hango may obtain some importance in the future as a transfer point for shipments of lumber during the wintertime while the other ports are closed to navigation.

HELSINGFORS, BORGA, AND LOVISA DISTRICT.

Helsingfors figures prominently in the lumber export trade of Finland, principally as a shipping port for a considerable number of mills located in the interior districts of central and southern Finland. There are also a few lumber mills in the immediate vicinity of Helsingfors, some of them operated in connection with woodworking establishments.

About 75 per cent of the total quantity of planed lumber exported from Finland is shipped from Helsingfors. The shipping season starts at the end of April and lasts until the beginning of February.

Borga is located east of Helsingfors. Lumber from this port is known for good quality. The logs sawn in the Borga district are mainly from the coastal and interior districts adjacent to the mills, but some logs, originating in the Kymmene River district are rafted to Borga from Kotka. The quality of the lumber produced is thus very similar to that produced in the Kotka district. Small quantities of planed lumber are exported from Borga. Navigation opens at the end of April and closes at the end of November.

The lumber exported from the Lovisa district is shipped from the port of Walkom, 4 miles from the city of Lovisa. There are very few sawmills in the vicinity of this port, and the lumber exported is mostly from mills on Paijanne Lake. Some of the most important mills are located at a distance of approximately 200 miles from the port. The cost of shipment from the interior mills is rather heavy in some cases, because the lumber must be transferred from barges to rail, involving expensive handling. Pulp wood constitutes part of the wood shipped from this district. Navigation generally opens at the beginning of May and closes during December.

KOTKA DISTRICT.

This is the largest shipping district in Finland and one of the most important in Europe. The lumber from the better mills in this district is considered standard in Finland, and before the war generally obtained approximately $0.61 to $2.45 per thousand feet more than was paid for lumber from other shipping districts. The mills are large and efficiently operated and there are practically no small exporters in the district.

The shipping facilities are very good and the logs are taken from practically all districts in southern Finland through an excellent system of floating. The quality of the timber from the different sections may vary to some extent, but careful grading, sawing, and seasoning of the lumber enable the mills to keep up their standards. The district is known for its ability to supply long lengths and makes a specialty of South African shipments.

Part of the pine lumber produced is sometimes graded into three qualities, besides cull lumber. The percentage of each quality is about as follows: First quality, 25 per cent; second quality, 35 per cent; third quality, 40 per cent. Limited quantities of planed lumber and box shooks are exported. The pulp and paper industry is very important in the Kotka district, and as a consequence no props or pulp wood are exported.

The Finnish Government recently acquired the majority of the stock in the largest saw and pulp mills in Kotka and is now the largest exporter in this district.

The shipping season lasts from the end of April to the end of November and is sometimes extended to the beginning of January.

FREDRIKSHAMN DISTRICT.

This is not an important shipping district and the mills are rather small. It is believed, however, that the cost of production may be somewhat lower in the Fredrikshamn district than in the adjacent districts where the labor situation usually is less satisfactory.

A large quantity of the log supply is taken from Kotka and rafted to Fredrikshamn. A considerable number of props are exported. The shipping season opens at the end of April and closes about the middle of December.

VIBORG DISTRICT.

The principal point of shipment in the Viborg district is Trangsund, located about 10 miles from Viborg. This is one of the most important shipping points in Finland and lumber from all over the eastern part of Finland is assembled there for export.

In the past Viborg shipments have not always had the best reputation, because the quality of the lumber has varied a great deal. There are numerous export merchants who buy lumber sawed by small mills scattered around in the country, and there has been very little uniformity in the shipments from one year to another. Lately, however, many of these smaller mills have been purchased by larger concerns, and the quality of the lumber from the Viborg shipping district has improved considerably during recent years. There are some large concerns known to ship standard quality lumber, and they have maintained their reputation for years.

One of the best known firms in Finland, located in this district, has been in the lumber export business since 1790. The logs are cut partly in the Vuoksen district between Lake Ladoga and the Gulf of Finland, and partly in the districts bordering the Saima water system.

The spruce from the Viborg district is excellent. The pine cut in the Vuoksen district is poor, while the pine in the Saima district is similar to that in central Finland. The reputable shippers in the Viborg district do not mix the lumber cut from the logs grown in the Vuoksen district with that from logs grown in the Saima district.

The lumber is taken on barges and on rail to Viborg, where it is loaded on barges and towed to Trangsund for shipment, or it may be taken on barges through the canals direct to the port. Large storage yards are maintained at the port. The average lengths of the lumber shipped from this district is about 14 to 15 feet for boards, 16 to 17 feet for battens, and 17 to 18 feet for planks.

Viborg is one of the most important districts for the shipping of props, pulp wood, and small timber. Limited quantities of hewn timber are also exported. Large quantities of firewood are shipped to Petrograd during normal times.

While some of the better exporters in the Viborg district may accept prices only slightly below those obtained for shipments from Kotka, the average price before the war was at a reduction of $1.23 to $1.85 and even $2.45 per thousand feet, in spite of the fact that some Kotka mills take part of their log supply from the same forests as the Viborg district mills.

Small quantities of planed lumber are also shipped from the Viborg district. Navigation opens at the beginning of May and closes at the middle of December.

PETROGRAD SHIPPING DISTRICT.

The mills located on the Finnish side of Ladoga Lake have their outlet for export through Petrograd during normal times. The lumber is barged across the lake, a distance of approximately 120 to 130 miles, and taken on the Neva River to Petrograd, where it is piled in yards for shipment.

The timber regions bordering Ladoga Lake are very important and are being extensively exploited, and large mills are being constructed. If the project of a canal between Ladoga Lake and the Gulf of Finland, connecting the many lakes on the Isthmus of Karelia, should be realized, these mills will ship lumber by this route.

Large quantities of timber, props, pulp wood, and firewood, are exported from this district. The lake is open to navigation from the end of April to the middle of December.

LUMBERMEN'S ASSOCIATIONS.

The benefits to be obtained from cooperation were not thoroughly understood in Finland until the time of the war. The Finnish lumbermen are very independent and contended that individual efforts are preferable to cooperation. The spirit of independence is not now so strong among the lumber exporters in Finland, and their policy in dealing with foreign customers is decided by their association, which has developed into one of the strongest of its kind.

The foundation of the exporters' association was laid in 1886, when the Finnish Sawmill Owners' Association was established. During the first years of its existence, this association was merely a lumbermen's club, the members meeting once a year to discuss matters of mutual interest. Soon afterwards the sawmill owners established a mutual fire insurance company and later the association established a liability insurance company for its members. Those sawmill owners who had large interests in farm lands and similar properties also established an agricultural association for more efficient development of such lands.

The good results obtained by the Swedish Lumber Exporters' Association were clearly realized by the Finnish exporters, and in 1911 the Swedish association approached the Finnish association and the Russian lumber associations on the Baltic, and asked them to consider closer cooperation. While negotiations to this effect were carried on the war broke out. In 1915 it was realized that the Finnish exporters might have to wait a long time before they could export their lumber. The large stocks on hand, and the danger of having some of the financially weak members depress the market by dumping their stocks when shipping was resumed, brought the Finnish lumber exporters very closely together, and a complete reorganization of the Sawmill Owners' Association was considered. It was also realized that the difficult labor problems could be best handled by an effective association, and an employers' association composed of the sawmill owners was established along the same lines as the Swedish Employers' Association.

SAWMILL OWNERS' SELLING ASSOCIATION.

The reorganized Sawmill Owners' Association is called the Finnish Sawmill Owners' Selling Association. In regard to the association's activities several plans were discussed. One plan was to have all the members of the association sell their lumber for export through one central organization and to have this organization establish agencies in the principal lumber centers abroad. This proposition was, however, rejected, because it was felt that the foreign agents generally had performed their services satisfactorily and that the selling through one organization might lead to dissatisfaction among the exporters.

The character of the Finnish lumber is decidedly different from the lumber exported, for instance, from the United States Pacific coast, where the quality and output from the various mills are uniform. In Finland every mill turns out a distinct product, and this circumstance makes it almost impossible to have such products handled by one central selling organization, as the customers in the different countries would demand the product of this or that mill, making it very hard for the central organization to allocate the orders among the mills to the satisfaction of both buyers and sellers. The association is, therefore, not exactly what the name implies, a selling organization, but is more nearly a price-fixing institution. It was decided to let the members of the association sell their own products. As soon as a sale is made the exporter must immediately report to the association, giving details in regard to the price obtained, specification, special conditions of the contract, the country of destination, and also the particular district in the country to which the lumber is being shipped. This information is immediately sent to all other members. The exporter, however, does not give the port of destination or the name of the customer.

A special committee of the association establishes minimum prices from time to time, covering each quality, dimension, and brand, and the members bind themselves not to sell at less than these prices. In special cases the members may sell at lower prices than stipulated, but must give good reasons for doing so.

In cases of breach of contract heavy fines are imposed, and to enable the association to collect these fines each member must give a guaranty covering a certain sum upon entering the association. In case a member should show any unwillingness to pay a fine the association can immediately collect it on this guaranty.

ASSOCIATION ACTIVITIES.

Besides the important work of maintaining prices, the association has other activities, such as representing the sawmill industry in cases where laws, taxes, export duties, etc., affect the members, and conducting campaigns in the press to further the interests of the lumber industry.

The association obtains information for its members in regard to foreign markets, competition by other countries, etc., and is expected to give advice to the exporters in regard to the selling policy. It also gathers statistics in regard to the stocks in Finland and in other countries, the logs on hand, and the proposed quantities to be cut in advance of each season.

The Finnish exporters have at times in the past curtailed their production by mutual agreement in order to stabilize the market. It has, however, been difficult to get all the members to agree on this point, but in the future it is believed that such steps can easily be taken whenever conditions warrant it. There are several regulations governing the selling policy of the members. They must not, for instance, consign more than 10 per cent of their annual production of lumber.

The association plans to establish an arbitration service abroad to settle claims and also a freight bureau to assist exporters. It has also considered the recommendation of a uniform cost accounting system, as it is believed that if the real cost of production were known it would strengthen the members' selling policy.

A close cooperation is maintained with the Swedish association, and all information in regard to stocks on hand, selling policy, prices, etc., is exchanged with this association. In regard to the prices of lumber for export, fixed relations have been established between prices in Finland and those in Sweden, and the Finnish exporters have so far been able to successfully maintain their price standards. As soon as shipping conditions in Russia improve, the Finnish association intends to establish a similar relationship with the Russian associations. In this way the exporters in northern Europe will be very strongly organized.

The Government recognition given the association during the war is significant. In February, 1918, the provisional Government requested the association to outline a plan for the regulation of the Finnish lumber trade, and as a result the lumber export trade was placed by the Government in the hands of the association. The association was given the power to grant export licenses, and it refused to grant licenses when the prices were below those established as minimum.

The number of mills engaged in the export business has decreased during recent years, but the average quantity shipped by each exporter is now much larger than it was before. It is seen, therefore, that the chances of successful cooperation between the exporters is now much better than formerly. Practically all the important exporters in Finland belong to the association, and the quantity of lumber shipped by the members represents more than 90 per cent of the total quantity of lumber exported from Finland.

The laws of Finland do not place any hindrance in the way of combinations of this kind, whether for products sold abroad or at home.

Before the war the association dues were about half a cent per thousand feet of lumber exported. During the war the dues were raised to about 1 cent per thousand feet. Small additional dues are also paid by the members of the employers' association and the agricultural association.

The activities of the Finnish Sawmill Owners' Association have so far been practically limited to the question of prices. Finland is now starting a new era of development and a great many new laws will be passed in regard to labor, taxes, etc., and most of these questions will materially affect the lumber industry.

As these questions are also of great interest to the paper and pulp manufacturers, it was decided at the beginning of 1919 to establish a central association for the wood-manufacturing industries in Finland. It is evident that one central association of this nature can represent all groups of manufacturers and exporters of forest products more effectively in dealings with the Government than if each group took up these matters separately. In the future the Finnish Sawmill Owners' Selling Association will therefore to a great extent be relieved of work bearing on the sawmill owners' relations to questions of a domestic nature, such as legislation, tariff, local transportation, etc., and will devote its time almost exclusively to the problems affecting the lumber export trade.

MUTUAL FIRE INSURANCE COMPANY.

The Finnish Sawmill Owners' Mutual Fire Insurance Co., which was started more than 25 years ago, has been very successful. In 1916 the amount of insurance was $34,000,000, and claims paid amounted to $141,000; in 1917 the insurance was $52,000,000 and claims paid $44,000; in 1918 the insurance was $75,000,000 and claims paid $51,000.

The premium for insurance of sawmills is about 1.2 per cent and for lumber yards is about 0.6 to 0.7 per cent. The losses during the war were remarkably small, in view of the fact that the whole country was in an uproar during part of 1917 and 1918 and burning and destroying of private property was carried on for months. Only one large sawmill and yard was burned during that time.

In 1917, immediately before the January revolution, the Finnish lumbermen realized the danger of having their stocks and mills burned by the Bolsheviks. Several companies held as much as 150 to 200 million feet of lumber in stock at that time, and it was evident that if such stocks were burned no existing fire insurance company in Finland would be able to stand the loss. Some of the principal sawmill owners entered into an agreement to the effect that they would mutually insure their stocks to cover loss by fire. The revolution was subdued before any damage was done to their properties.

EXPORT TRADE DURING THE WAR AND UNTIL AUTUMN OF 1919.

Before the war there had been keen competition between the individual exporters in Finland and also with the exporters in Sweden and Russia. While the exporters in Russia were unorganized, the Swedish exporters had a splendid organization. The importing countries were often flooded with northern European lumber and the prices were usually low. When the war broke out Finland was automatically shut off from the world's markets, the Baltic Sea being controlled by the Germans. The Finnish exporters were, however, optimistic at the start in regard to the outlook, because they expected that lumber would be in demand after the war and that high prices would prevail. The war, however, did not end as quickly as had been expected, and a great many yards in Finland were, at an early stage of the war, filled to capacity with lumber. At the same time a great many importers in foreign countries canceled their orders because the prospects for shipping were very poor.

During the late summer and autumn of 1915 several new contracts were made in the hope of having shipments resumed in the near future. The prices were generally very low, being approximately $20 per thousand feet for 7-inch pine battens and somewhat higher for boards.

The following contract prices for the unsorted grade of spruce lumber from the district of Abo are representative of those made during the early part of 1915:

	Per M feet.		Per M feet.
3 by 9 inches	$24.90	2 and 2½ by 6 inches	20.07
3 by 8½ inches	22.97	1¼ by 8 inches	23.35
3 by 8 inches	22.00	1¼ by 7 inches	21.42
2½ by 8 inches	22.00	1¼ by 4½ inches	18.53
3 and 2½ by 7 inches	20.65	1 by 4 inches	18.03
2½ by 6½ inches	20.65		

Contracts were made with importers in Holland, Denmark, France, and England. However, hopes in regard to shipping were not realized and no additional sales were made for some time. During the autumn of 1916 a great many firms apparently became discouraged and sold large quantities at approximately $25 to $29 per thousand feet. This was a most unfortunate move, because the prices increased very materially after that time. This lumber was bought by foreign speculators and later was sold over and over again at very high prices.

WAR-TIME SALES AND PRODUCTION.

During 1916 the southern part of Finland was able to sell large quantities of lumber to Russia for war purposes, and not only did the lumbermen make large profits, but also the paper and pulp concerns that were closely allied with the lumber mills and often owned by the same people. The Russian army placed large orders in Finland for box shooks, specifying this material to be free from knots, and as there was not enough clear lumber in the whole of Finland to fill these orders, the mills often produced shooks "free from knots" by simply boring out the knots and inserting wooden pegs in their place. This kind of "clear lumber" would naturally not do for commercial purposes, and was manufactured only as a war measure.

In 1917 a few mills along the northern part of the Bay of Bothnia shipped some lumber over to Sweden and from there on rail to Norway, and thence it was shipped to England, but the cost of transportation was very high and the experiment was not repeated. During 1917 very few contracts were made for Finnish lumber. At the end of the year a Belgian proposition was made to the Finnish lumbermen to induce them to contract for the shipment of large quantities of lumber on consignment after the war was over, but it is understood that very few concerns signed such contracts.

The sawmills had, up to 1917, operated at a fairly reasonable cost of production, but after that time wages and supplies increased greatly and the cost of production in proportion. It is remarkable that the Finnish lumbermen were able to continue operations during the difficult times of the war, when they had no chance of exporting any but very small quantities. They repiled their lumber solid in the yards to save space.

It was a great help financially to the lumbermen that they were not exclusively engaged in the lumber business, but also had other activities such as farming, pulp and paper making, and similar industries which yielded large profits during the war. This enabled them to keep their mills running. The banks were also liberal in giving loans, taking the mills and stocks as security. Money was plentiful and it was easy to obtain loans on equitable terms.

The labor situation became very aggravated with the rising cost of living during 1917. The crisis came during the late autumn and winter of 1917 and the first four months of 1918. During these months a great many mills had to close and the production of lumber was very small. Only about 40,000,000 feet of lumber and one sawmill were burned during the revolution, but the damage done to other property was considerable.

During the revolution some of the largest lumber companies issued checks to be used instead of money. These checks circulated for more than a year after the revolution was subdued and were taken at par with the money issued by the Government. This shows what a financially strong position some of these companies have in Finland.

Up to March 1, 1919, 532,000,000 feet of Finnish lumber had been sold since the outbreak of the war, as follows:

	Board feet.
Pine lumber	377,000,000
Spruce lumber	129,000,000
Better grade of cull stock	12,000,000
Staves, laths, etc	14,000,000

These stocks were distributed among the following countries:

	Board feet.
United Kingdom	49,000,000
Germany	31,000,000
France	43,000,000
Denmark	116,000,000
Holland	95,000,000
Sweden	17,000,000
Norway	4,000,000
Russia	177,000,000
Total	532,000,000

The majority of the stocks sold to Russia represent lumber bought by speculators with a view to selling it again.

PRICES IN 1919.

Minimum prices per thousand feet for unsorted pine lumber from the Bjorneborg-Kotka district (basis), as fixed by the association and ruling up to the spring of 1919, were as follows:

Width.	Finnish marks.	Dollars at $0.193 per mark.	Dollars at $0.10 per mark.
12 inches	530	102.29	53.00
11 inches	505	97.47	50.50
10 inches	480	92.64	48.00
9 inches	457	88.20	45.70
8 inches	414	79.90	41.40
6½ and 7 inches	391	75.46	39.10
6 inches	379	73.15	37.90
5½ inches	371	71.60	37.10
5 inches	366	70.64	36.60
4½ inches	351	67.74	35.10
4 inches	338	65.23	33.80
3½ inches	323	62.34	32.30
3 inches	318	61.37	31.80

NOTE.—During the period this scale of prices was in effect the average value of the Finnish mark was about 10 marks to the dollar. As the rate of exchange can not give a correct value of the prices obtained, it is advisable to consider only the quotations expressed in Finnish currency.

Spruce boards 8 to 12 inches wide were sold at higher prices than 8 to 12 inch planks. No spruce was sold at any reduction from pine, contrary to conditions before the war. Short lengths of 6, 7, and 8 feet, not in excess of 5 per cent of any one cargo were sold at a reduction of 25.30 marks per thousand feet, instead of two-third price as during prewar days. The minimum prices ruling from January 1, 1919, called for an advance in spruce stock of 25.30 marks per thousand feet, the reason being that the stock of spruce in Finland at that time amounted to only one-seventh of the total stock of lumber, and the spruce stocks in other exporting countries were also very low.

The minimum prices for small-dimension lumber were as follows:

Schaalbretter.—Stock ¾, 1, and 1¼ by 4 inches and wider, 313 marks per thousand feet. Stock 6, 7, and 8 feet long, 4, 4½, and 5 inches wide, at a reduction of 25.30 marks; 5½ inches and wider at two-thirds price.

Cement staves.—When 2-inch stock does not exceed 10 per cent, 354 marks per thousand feet. If an excess of 10 per cent of 2-inch stock is shipped, the excess to be sold at a reduction of 25.30 marks per thousand feet.

Split wood.—Of planks and battens, 480 marks per cubic fathom (216 cubic feet); of scantlings and boards, 460 marks; of narrow boards, 440 marks.

Slating battens.—Stock ¾ by 1¼ to 3 inches, 316 marks per thousand feet; 1 and 1⅛ inch stock, 316 marks; ¾ and ⅞ inch stock, 305 marks. Prices include bundling. Lengths of 5, 6, 7, and 8 feet to be sold at a reduction of 25.30 marks per thousand feet.

Laths.—First quality, 607 marks per thousand feet, second quality, 556 marks.

The reduction for discolored lumber not to exceed 25.30 marks per thousand feet.

In selling small quantities from 4,000 to 10,000 feet of one dimension an extra charge of 10.10 marks per thousand feet was established, and for quantities of less than 4,000 feet of one dimension 20.20 marks per thousand feet.

For loading small quantities from 4,000 to 10,000 feet of one dimension an extra charge of 5.50 marks per thousand feet was made, and for quantities less than 4,000 feet of one dimension, 10.10 marks.

For bundling sawn lumber 30.30 marks per thousand feet extra was charged, and for cement staves 25.30 marks per thousand feet.

Broom handles vary a great deal in price, but during the spring of 1919 this stock was sold at approximately 400 marks per thousand feet.

The customary reductions for the better class of cull lumber for export were given in the early part of 1919 as 71 to 76 marks per thousand feet below the price of unsorted grade.

The association divided the country into seven shipping districts and the difference in price between each district and the Kotka-Bjorneborg district (basis) was established as follows: Borga-Lovisa district, reduction of 5.05 marks per thousand feet; Jakobstad, Abo, Raumo, Helsingfors, and Fredrikshamn district, reduction of 7.58 marks; Viborg, Hango, and Nystad (in Abo district), reduction of 10.10 marks; Brahestad, Wasa, and Gamla Karleby district, reduction of 15.20 marks; Christianstad and Kasko district, reduction of 17.70 marks; Tornea and Kemi district, reduction of 20.20 marks.

The relation of prices between the different districts in Finland has changed a great deal when compared with the prices before the war. The freight question, which is now a decisive factor, did not play an important part before the war. The difference in the freight rates between the different ports in Finland previously seldom varied more than 61 cents up to $1.23 per thousand feet.

A fixed relation of prices between the basis of the Finnish quotations and the prices for the Hernosand district in Sweden was established through agreement between the Finnish and the Swedish associations at £2 10s. per standard ($6.14 per thousand feet) discount for Finnish stocks.

In order to reenter the market, the Finnish exporters made an agreement with the Swedish exporters to sell the first 100,000,000 feet at lower prices than the established minimum prices.

The minimum prices were advanced by 10 shillings per standard ($1.23 per thousand feet) in June, 1919. Prior to this time the Finnish exporters had tried to quote in Finnish marks, but these efforts were partly given up later in the summer.

FACTORS INFLUENCING TRADE.

The rate of exchange is very important to the lumber exporters. While the par value of the Finnish mark is approximately 25 marks to the pound sterling, the rate of exchange during the war fluctuated materially. If the lumber quotations were made in Finnish marks, it is evident that the importers would take the chances on fluctuations in the rate of exchange. By quoting in foreign exchange the exporter must assume these risks. The lower the value of the Finnish mark, the higher the profit of the exporter, because he receives more marks per foreign monetary unit.

The prices obtained in July, 1919, were approximately 455 to 505 marks ($87.82 to $97.47 at par) per thousand feet for 7 inch pine battens of the best productions. Planks and battens were most in demand.

Up to August 1, 1919, approximately 990,000 board feet had been sold since the outbreak of the war, while only 297,000 feet had been exported.

The quality of the Finnish lumber which had been "on the sticks" for more than five years gave the importers a great deal of anxiety. It was found upon arrival, however, that the Finnish lumber was not discolored to any great extent and that the quality was satisfactory. Naturally a large per cent of the lumber which had been piled in the open had a grayish color, but this is not considered a very serious defect, so long as the lumber is not otherwise discolored.

During the war the Finnish lumber exporters had very heavy expenditures, and as they were able to export only a small percentage of their stock, they often had to appeal to the Finnish banks for financial assistance.

The Government has shown a farsighted policy in assisting the exporters to obtain satisfactory prices for their products, as it was realized that if the exporters dumped their lumber at any price such action would cause a financial panic in Finland. Not only did the Government control the selling price of the lumber for export by instituting a system of price control, but it has lately taken definite steps toward the financing of such lumber exporters as may be in need of help. It is reported that during the late summer of 1919 the Government, through the Bank of Finland, granted the lumber exporters a loan of about 130,000,000 marks ($25,090,000 at par). The conditions on which this loan was made have not been officially stated. The Finnish Government realizes that the lumber stocks in Finland are among the principal assets of the country at the present time, and that satisfactory profits can be made if the selling is conducted judiciously. The financial condition of the country, as a whole, is threatened and any decrease in the price of lumber would seriously affect the revenues of the Government.

STOCKS ON HAND IN AUTUMN OF 1919.

On account of the difficult shipping conditions the large Finnish stocks have moved but slowly, and on September 1, 1919, the following stocks were held by mills at the following shipping ports and in adjacent districts:

	M feet.
Petrograd	16, 612
Viborg	519, 675
Fredrikshamn	7, 722
Kotka	500, 435
Helsingfors	174, 218
Ekenas	6, 607
Abo	28, 627
Bjorneborg	292, 054
Wasa	25, 375
Uleaborg	309, 539
Tornea	60, 624
Total	1, 941, 488

APPENDIXES.

Appendix A.—IMPORTS OF FOREIGN LUMBER.

Since Finland is one of the world's largest wood-exporting countries, it is evident that the importation of foreign woods must be limited. The native supply of ordinary construction lumber is ample. Large quantities of birch are produced in Finland, which, with Finnish oak, is used as a general utility wood. These two species of hardwoods partly supply the domestic market, but the country has no native wood suitable for the better grade of furniture, shipbuilding material, etc., and must import lumber for these purposes. The imports during 1912 and 1913 are given in the following table:

Kinds.	1912		1913	
	Quantity.	Value.	Quantity.	Value.
Lumber........board feet..	269,000	$37,625	312,000	$38,670
Veneer........pounds..	397,000	22,790	688,000	40,210
All other kinds of wood........board feet..	16,270,000	331,140	9,690,000	296,870
Total........	....	391,555	....	375,750

Sources of imports of wood in 1913 were as follows:

Countries.	Lumber.	Veneer.	Other kinds.
	Board ft.	*Pounds.*	*Board ft.*
Belgium........	....	....	80,000
Denmark........	62,000	50,000	70,000
East Indies........	4,000	....	....
Germany........	118,000	130,000	821,000
Netherlands........	....	....	13,000
Russia........	1,000	490,000	7,544,000
Sweden........	94,000	18,000	1,134,000
United Kingdom........	33,000	....	28,000
Total........	312,000	688,000	9,690,000

A large percentage of the lumber imported into Finland is of American origin, but the United States does not figure in the Finnish statistics as the country of shipment. It is evident that large quantities of the lumber imported by Finland are reexports from other countries. Russia and Germany have been practically the only European countries exporting domestic lumber, and Germany has also been engaged in the reexportation of foreign lumber.

The Finnish statistics do not give a very detailed classification of the kinds of lumber or timber imported. The principal industries interested in the use of foreign lumber and timber are listed in the following statement, which is taken from official statistics for 1913:

Industries.	Number.	Value of production.
Iron and steel works and foundries	93	$6,060,000
Shipyards (steel)	8	1,949,999
Furniture, sash and door factories, etc	63	1,679,000
Shipyards (wooden vessels)	17	251,000
Veneer factories	3	154,000
Wagon stock	1	154,000
Ski factories	4	
Molding factories	2	
Carriage factories	2	
Toy factories	3	

From official statistics, it appears that the furniture, sash, and door factories use annually foreign lumber to the value of $160,000, and the veneer factories employed raw material from foreign countries to the value of about $12,000. Foreign lumber is not ordinarily used in house construction in Finland. Unpainted wood panels and other interior finish are not commonly used, because the native woods do not show any pretty grain and are otherwise defective, having a large number of knots. Most of the interior finish made of native lumber is, therefore, painted or grained to cover up these defects. Wall paper and plaster are ordinarily used, because interior finish of foreign woods is too expensive. Only in the better class of private houses in the cities and some official buildings have foreign woods been used for doors, floors, stairs, panels, etc.

On account of the increased wealth accumulated during the war, it is expected that the demand for foreign lumber in Finland will be materially increased. House construction was greatly hampered during the war, and a great deal of reconstruction work must be done to replace thousands of homes and buildings destroyed in 1918.

Among the principal consumers of imported lumber in Finland are the Finnish railroads. In car construction and repair work considerable Russian oak is used. Japanese oak was tried some years ago and gave good satisfaction. The oak was imported in hewn logs. For car finish American walnut and American ash are used to some extent. It is intimated that short lengths of clear softwood and hardwood lumber could well be used in the car shops.

The Finnish rolling stock is in dire need of repair, and there is a great shortage of cars as a result of the destruction of railroad material during the revolution and the removal of a great many cars into Russia by the retiring Bolsheviks. The car shops will probably need some quantities of foreign lumber, although native species of wood will probably be more extensively used than heretofore.

Some of the larger Finnish furniture factories had built up a very profitable trade with Russia before the war and considerable quantities of Finnish furniture were exported to this market. This trade may be resumed as soon as conditions allow, and if so there should be a good market for furniture woods in Finland. Before the war some American lumber was used in Finland.

MARKET FOR AMERICAN HARDWOODS.

American white oak is the species most in use, and there has always been a comparatively good demand for such stock. White oak is used for parquet flooring, interior finish, and furniture. American white oak from the central hardwood regions of the United States is preferred. White oak from the Gulf States has been tried, but it is not so well liked because of its hardness. The most acceptable sizes of American white oak are as follows: Thickness, ½, ¾, 1, 1¼, 1½, 2, 2½, and 3 inches; width, 6 inches and wider; length, 6 to 20 feet. First and second qualities are usually imported.

Oak parquet flooring is made in the following dimensions: 8½ by 8½ inches by one-half inch. It is made of two pieces glued together. It was learned upon inquiry that small pieces of oak 30 to 40 inches in length could very well be used for parquet instead of sawing parquet flooring from commercial lengths. Common quality of oak has been found unsuitable for this market. American red oak has been tried, but has not given satisfaction.

Of other American hardwoods some quantities of red gum have been imported and proved very popular. Red gum is used for furniture and interior finish, but it is claimed that this wood is likely to warp and that it is too soft to be entirely satisfactory. The beautiful figuring of the wood is much appreciated, but the sales have not been pushed sufficiently to establish an important market for this species.

Sap gum has also been imported in small quantities and sold under the name of "hazel pine." It is claimed that the wood is liable to split, check, and warp and that it can not, therefore, compete with the native birch. Formerly there was a fairly good demand for sap gum for the construction of ambulances for the army. It is not expected that this wood will find a good market in Finland, on account of the competition encountered from native birch.

A curious incident occurred before the war when some gum logs were imported. Red gum is known in Finland as "satin walnut" and is subject to import duty. However, sap gum is in another class and may be imported free of duty, as it termed "hazel pine." The customs authorities were puzzled when they found that "hazel pine" and "satin walnut" were from the same tree. There should be a good market in Finland for red gum veneer, but this product is not known as yet.

Yellow poplar (called white wood in Finland) was extremely popular, especially for pattern wood, etc., but during recent years the high price of this material decreased the demand.

MARKET FOR AMERICAN SOFTWOODS.

American softwood is naturally not imported in large quantities, because the native supply of softwood is abundant.

Southern yellow pine.—Limited quantities of southern yellow pine have been used for decking for steamers and sailing vessels. This wood is well known in Finland and used for shipbuilding and dock construction, but it has not been pushed for other purposes.

Cypress.—This wood is almost unknown in Finland and has not come into general use on account of its high price. About 10 years ago the House of Representatives in Helsingfors was finished in cypress, but this is the only case, so far as known, where cypress has been used in Finland.

Douglas fir.—Douglas fir has been used to a limited extent, mainly for decking of vessels. The wood has been imported in 3 to 4 inch planks and also in timbers 16 to 18 inches square. This stock is resawn into smaller sizes. Only clear lumber has been imported. No effort has been made to push the sale of Douglas fir in Finland, but the market may not be important for this species unless shipbuilding should be increased.

California redwood is not known, but may be sold in limited quantities for interior finish and also for other special purposes for which this wood is adapted.

There is no market in Finland for shingles.

The other American species of softwoods are practically unknown, but the builders of vessels have for a long time endeavored to find a suitable material for the construction of small boats, etc., and have not been able to obtain satisfactory results from any European woods so far. There may be a possible market for white cedar for this purpose.

Other foreign species.—The most popular foreign wood in Finland is mahogany, but as this is very expensive, its use is limited to the better class of furniture, interior finish, etc. Mahogany stands in a class by itself and no other wood has been able to compete with it. Both African and Central American mahogany are used.

RUSSIAN AND POLISH OAK.

Considerable quantities of Russian and Polish oak were imported into Finland, particularly after the war broke out, because the supply from other countries was then cut off. Russian oak is imported in logs 12 to 18 inches in top diameter. The quality of Russian and Polish oak is generally satisfactory for ordinary purposes. However, they are not as uniform in color as American oak and do not show as pretty grain.

Russian beech is imported to some extent and used by machine shops for special purposes. Russian beech logs can not be obtained larger than 12 inches in diameter, and the importers are anxious to secure wider material.

GERMAN OAK.

German oak is considered the best in Europe and some quantities have been imported into Finland. This lumber is considered on a par with American oak, but the stock is not edged. The entire log is shipped, cut into lumber, however, but the shape of the log is retained by placing one piece of lumber on top of another as they came from the saw. In this way the carpenters may match one panel with another.

VENEER.

The market for imported veneer is restricted to mahogany and similar high-grade products. Birch veneer is an important product of Finland and extensively used in the country. The domestic veneer is made of birch and aspen and put up in three and five-ply stock in thicknesses of 3, 4, 4½, 5, 6, 7, 8, 9, 12, 15, and 25 millimeters. It is sold locally by the square meter and in Helsingfors in September, 1917, prices for first quality birch veneer ranged from $0.87 for 3-millimeter stock to $4.73 for 25-millimeter stock. For second quality veneer a discount of 10 per cent is allowed, and for third quality 30 per cent.

Veneer made of aspen is not important and was sold at the following discounts from birch veneer prices: First quality, 10 per cent; second quality, 20 per cent; and third quality, 40 per cent. These prices are manufacturers' prices to wholesalers. Birch veneer is not cheaper than imported veneer, but is better suited for the Finnish climate and does not warp.

IMPORTERS.

There is only one firm of any consequence specializing in the importation of foreign woods in Finland. This is the Aktiebolaget Mahogany, Gräsviks Gatan 21, Helsingfors. This company maintains a yard and a small plant for resawing of logs and lumber.

During the war many smaller concerns were established for the handling of foreign woods, but most of them discontinued business, as the scarcity of foreign woods led to very high prices. Many individuals were induced to enter this field without the necessary knowledge of the business.

METHODS OF IMPORTATION.

In prewar days most of the lumber imported to Finland was sold through British, Danish, German, or Swedish agents. Some of these agents acted on behalf of the exporters in the producing countries, but generally the lumber was reexported to Finland from Germany, Denmark, Sweden, the United Kingdom, etc., as Finland did not have direct steamship lines to the most important producing countries. The lumber was generally transshipped from Hamburg, Liverpool, Copenhagen, and Stockholm. It is evident that this was a very unsatisfactory way of handling the imports, and the prices charged were considerably higher than would be the case if the lumber had been shipped direct to Finland.

The importation of Russian hardwoods is handled in a peculiar way. Small schooners are loaded at ports in the Baltic Provinces of Russia and sent to Finland, generally to Helsingfors, where the skipper distributes the cargo among consumers and importers alike. Some shipments are made by railroad, and this lumber is generally sold through agents.

German lumber has been sold in a very inefficient way. Before the war Finland was swamped with German agents, who picked up small orders from consumers, contractors, importers, and wholesalers, thereby entirely spoiling the market.

Swedish houses have generally made contracts with the more important consumers in Finland, such as shipyards, furniture factories, railway car shops, etc., and have shipped the lumber from their own yards in Sweden to these consumers.

Danish agents have often secured the agency for Finland for American shippers. American lumber has usually been sent on the regular liners to Copenhagen and transshipped from this point to Finland.

The British agents representing British importers have seldom visited Finland, and sales have been made through correspondence and not by personal solicitation.

It was reported that Finland had been visited occasionally by American exporters, but that these exporters had made no arrangements for the establishing of permanent connections in Finland and had left the Finnish business to be handled by European agents. The foreign agents have at times extended credit to the consumers in Finland, thereby making them dependent upon their services.

COMMENT ON AMERICAN METHODS.

After investigation among the various importers and consumers of American lumber, no serious complaint was heard in regard to American methods of exporting. The impression was, however, that this market had been neglected by the American exporters and that no efforts had been made to enlighten the public in Finland on the merits of American woods. The agents handling American woods also handled other woods and were not particularly interested in the selling of American lumber unless the profits on such sales were more satisfactory than on the sales of lumber shipped from other countries.

It was also stated that the agents themselves often lacked the necessary qualifications to advocate American lumber for special uses. It made little difference to them whether the lumber was used for furniture or for decking. If the lumber was put to a use for which it was unsuited it would be easy for the agent to sell another species of wood from another country the next time.

The same conditions apply to Finland as to most of the unimportant markets for American lumber in Europe; that is, on account of the passing through several hands, transshipment, etc., the cost of the lumber delivered in Finland has been very high in comparison with the prices which were obtained by the exporter in the producing country. The dealers in Finland have often preferred to sell small quantities at a high profit rather than take moderate profits on large sales at more reasonable prices, whereby American lumber could have found a larger market. These conditions must largely be attributed to the exporters' lack of interest in this market.

PRICES.

It serves no purpose to go into detail in regard to the prices paid before the war for foreign lumber in Finland. Conditions in Russia and Germany, which were the principal suppliers of this commodity, have changed so radically that these countries will likely never be able to deliver lumber at anything like the prices prevailing before the war. During the war the prices on foreign lumber were fantastic and the stocks of most varied kinds, which makes any attempt at price statistics futile.

PROPOSED PLAN FOR HANDLING EXPORTS OF AMERICAN LUMBER.

In the near future probably one or two regular steamship lines between Finland and the United States will be instituted. This will open up possibilities for an increased export of lumber products from the United States, and advantage should be taken of these conditions, because it will then no longer be necessary to have American lumber transshipped from other European ports. No doubt several importers of American lumber will be established, as the demand for foreign lumber will be greater than it was in prewar days.

It is believed that the Finnish market may be of such importance to the American lumber exporters that Finnish agents can be assigned to this territory instead of giving the representation to some foreign agent more or less unfamiliar with Finnish conditions. Like the Scandinavians, the Finns are inclined to give preference to their own countrymen, and by having a resident agent the territory could be covered to better advantage.

There have been recently established in Finland a great many import and export agencies that handle American products, and among these agencies there may be several willing to establish lumber departments, directed by persons conversant with American lumber. A certain amount of exploitation work should be a part of their activities.

It was found upon investigation that very good results were obtained by the distribution of information and samples to merchants, manual art schools, technical institutes, etc. Advertising of lumber in a modern way is unknown in Finland, and if undertaken it is believed that good results may be obtained.

The services of an agent are very desirable in Finland, because no one importer would probably be in a position to take any large quantity of American lumber at one time. An agent could, however, combine several orders, thereby making up a shipment sufficiently large to be of interest to the American exporters.

In dealings with this country a very close differentiation between importers, wholesalers, and consumers should be made, in order not to spoil the market as was done before the war by inefficient methods practiced by German exporters.

IMPORT DUTY ON LUMBER.

The tariff on imported wood, in effect from March 26, 1919, is as follows:

Round logs		No duty.
Sawn lumber, minimum thickness, 7 millimeters:		
Spruce, pine, birch, and aspen		No duty.
Elm, beech, and alder	per kilogram	0.02 mark ($0.0017 per pound).
Other kinds of wood	do	.05 mark ($0.0044 per pound).
Veneer less than 7 millimeters thick:		
Spruce, pine, birch, and aspen, per kilogram		.02 mark ($0.0017 per pound).
Elm, beech, and alder	per kilogram	.05 mark ($0.0044 per pound).
Other kinds of wood	do	.15 mark ($0.0132 per pound).

Appendix B.—EXPORTS OF DOMESTIC LUMBER.

EXPORTS OF PINE AND SPRUCE PLANKS, BATTENS, AND BOARDS (ROUGH), 1894 TO 1918.

Years.	Planks.	Battens.	Boards.	Total.
	M feet.	*M feet.*	*M feet.*	*M feet.*
1894	130,906	241,563	356,610	729,079
1895	122,911	236,314	342,460	701,685
1896	111,182	295,338	376,763	813,283
1897	136,590	314,872	393,580	845,042
1898	122,126	326,345	397,083	845,554
1899	158,360	360,262	408,703	927,325
1900	153,125	329,845	441,362	924,332
1901	142,404	294,394	451,900	888,698
1902	154,686	366,176	489,061	1,009,923
1903	165,535	354,755	513,852	1,034,142
1904	144,272	359,274	527,951	1,031,497
1905	137,127	383,170	533,764	1,054,061
1906	167,195	403,193	578,145	1,148,533
1907	135,065	354,966	546,140	1,036,171
1908	145,497	330,148	527,194	1,002,839
1909	153,131	358,075	564,282	1,075,488
1910	181,723	378,761	602,452	1,162,936
1911	171,095	363,332	626,881	1,161,308
1912	193,776	397,906	658,229	1,249,911
1913	217,176	507,796	802,283	1,527,255
1914	84,688	250,322	304,872	639,882
1915	1,952	2,919	8,313	13,184
1916	5,777	5,634	11,198	22,609
1917	2,518	4,884	7,117	14,519
1918	5,444	23,203	82,159	110,806

EXPORTS OF PINE AND SPRUCE FIREWOOD, 1894 TO 1918.

Years.	Cubic feet.	Years.	Cubic feet.	Years.	Cubic feet.
1894	13,353,000	1903	15,722,000	1911	6,525,000
1895	15,690,000	1904	17,130,000	1912	9,053,000
1896	11,339,000	1905	15,351,000	1913	[a] 9,026,000
1897	11,312,000	1906	12,740,000	1914	11,072,000
1898	10,926,000	1907	11,410,000	1915	20,856,000
1899	15,453,000	1908	11,564,000	1916	50,926,000
1900	18,421,000	1909	10,327,000	1917	46,376,000
1901	15,721,000	1910	7,403,000	1918	2,120,000
1902	14,242,000				

[a] Of this amount 8,370,000 cubic feet went to Russia and 655,000 cubic feet to Sweden.

VALUE OF EXPORTS OF PINE AND SPRUCE LUMBER, 1894 TO 1916.

Years.	Planks, battens, and boards, rough.	Planed lumber.	Years.	Planks, battens, and boards, rough.	Planed lumber.
1894	$9,946,000	....	1906	$20,766,000	$17,000
1895	9,560,000	....	1907	19,477,000	25,000
1896	11,106,000	$3,000	1908	16,200,000	2,000
1897	12,520,000	23,000	1909	18,577,000	2,000
1898	14,231,000	....	1910	22,864,000	50,000
1899	15,284,000	....	1911	23,425,000	88,000
1900	16,683,000	1,000	1912	23,482,000	201,000
1901	15,050,000	4,000	1913	30,512,000	449,000
1902	17,979,000	12,000	1914	12,876,000	230,000
1903	18,790,000	37,000	1915	198,000	10,000
1904	16,369,000	20,000	1916	470,000	17,000
1905	17,610,000	25,000			

EXPORTS OF PINE AND SPRUCE LUMBER BY KINDS AND COUNTRIES, 1912 AND 1913.

1912.

Countries of destination.	Planks.	Battens.	Boards.	Split wood.	Staves, etc.	Planed lumber.	Other kinds.
	M feet.	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*	*M feet.*
Russia	12,199	10,320	25,221	1,464	1,375	232	35
Sweden	1,006	698	976	231	687	1,159	2
Norway	227	1,211	189	6,715	994	....	80
Denmark	691	3,808	49,637	1,278	6,645	....	46
Germany	1,644	25,002	206,428	119	3,085	177	5,874
Netherlands	8,625	41,924	75,773	842	1,194	1,627	9,616
Belgium	10,580	45,820	78,747	674	12,223	....	3,548
United Kingdom	61,212	160,423	77,907	55,717	30,885	4,209	29,655
France	48,617	82,446	109,643	31	....	....	1,057
Spain	34,948	23,110	27,583	13	....	....	267
Portugal	2,888	401	....	....	....	....	....
Algeria	2,561	227	2,478	....	....	....	....
Morocco	1,007	391	491	....	....	....	70
Senegal	890	....	....	....	....	27	....
Cape Colony	1,946	1,478	669	242	....	....	28
Natal	1,392	647	1,045	16	....	633	72
Portuguese East Africa	2,697	....	1,442	....	....	444	....
Brazil	646	....	....	....	....	....	....
Total	193,776	397,906	658,229	67,342	57,088	8,508	50,350

1913.

Russia	11,576	14,451	24,753	1,373	1,163	318	10
Sweden	662	992	2,515	62	594	....	201
Norway	188	2,569	697	4,571	2,756	....	327
Denmark	1,334	4,307	59,305	574	7,470	....	465
Germany	3,185	28,898	241,130	144	5,190	....	7,035
Netherlands	8,850	54,801	96,178	924	2,226	2,481	13,484
Belgium	6,565	54,754	89,289	1,183	10,864	....	3,269
United Kingdom	61,932	195,576	105,796	67,867	39,267	11,882	38,110
France	61,360	117,104	134,252	222	....	....	1,411
Spain	38,950	25,565	34,856	....	....	....	360
Portugal	3,189	1,211	....	....	....	....	....
Egypt	357	1,741	1,916	....	....	....	....
Algeria	4,438	300	4,435	....	....	....	53
Morocco	1,431	1,247	1,783	....	....	260	219
Senegal	1,456	1,515	54	....	....	39	....
Cape Colony	2,408	1,737	1,692	320	....	909	11
Natal	4,019	978	1,695	292	184	2,134	....
Portuguese East Africa	5,196	....	1,931	....	....	945	....
Other countries	80	50	6	....	638	....	1,470
Total	217,176	507,796	802,283	77,532	70,352	18,968	66,425

EXPORTS OF PINE AND SPRUCE ROUGH LUMBER IN 1912 AND 1913: PERCENTAGE TO EACH COUNTRY.

Countries of destination.	1912				1913			
	Planks.	Battens.	Boards.	Total.	Planks.	Battens.	Boards.	Total.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Russia	6.0	2.5	3.8	3.9	5.3	2.8	3.0	3.3
Sweden	.5	.2	.3	.2	.3	.1	.3	.3
Norway	.1	.5	.1	.1	.1	.5	.1	.2
Denmark	.3	.9	7.5	4.3	.6	.8	7.3	4.2
Germany	.8	6.2	31.3	18.7	1.4	5.6	30.0	17.9
Netherlands	4.9	10.5	11.5	10.1	4.1	10.7	11.9	10.5
Belgium	5.5	11.5	11.8	10.8	3.0	10.6	11.1	10.0
United Kingdom	31.6	40.3	11.9	24.0	28.8	38.5	13.1	23.7
France	25.0	20.9	16.6	19.2	28.2	23.6	16.6	20.5
Spain	18.1	5.8	4.1	6.9	17.9	5.0	4.3	6.5
Portugal	1.5	.1	....	.3	1.4	.2	....	.3
Egypt	....	....	....	....	.1	.3	.2	.3
Algeria	1.3	.1	.5	.4	2.1	.1	.5	.6
Morocco	.6	.1	.1	.2	.6	.5	.8	.3
Senegal	.5	....	....	.3	.7	....	.1	.3
Cape Colony	1.0	.3	.1	.2	1.1	.3	.2	.5
Natal	.7	.1	.2	.3	1.9	.3	.3	.5
Portuguese East Africa	1.2	....	.2	.1	2.4	.1	.3	.1
Other countries	.4	....	....	....	....	....	....	....
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

EXPORTS OF PINE AND SPRUCE PLANED LUMBER IN 1912 AND 1913: PERCENTAGE TO EACH COUNTRY.

Countries of destination.	1912	1913	Countries of destination.	1912	1913
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Russia	2.7	1.7	Senegal	0.3	0.2
Sweden	13.6	....	Cape Colony	....	4.8
Germany	2.1	....	Natal	7.4	11.3
Netherlands	19.2	13.0	Portuguese East Africa	5.2	5.0
United Kingdom	49.5	62.6			
Morocco	....	1.4	Total	100.0	100.0

EXPORTS OF PINE AND SPRUCE ROUND TIMBER, ETC., BY COUNTRIES IN 1913.

Countries of destination.	Round timber.	Telegraph poles.	Props.	Pulp wood.	Other kinds.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Russia	4,039,000	....	8,384,000	2,989,000	2,000
Sweden	14,179,000	....	....	....	....
Norway	....	....	145,000	2,613,000	....
Denmark	....	....	50,000	....	....
Germany	....	....	104,000	764,000	....
Netherlands	130,000	82,000	399,000	4,032,000	....
Belgium	....	....	773,000	176,000	....
United Kingdom	....	....	51,487,000	170,000	....
France	1,000	....	2,608,000	6,388,000	....
Spain	....	....	....	831,000	....
Egypt	....	1,000	5,000	....	....
Algeria	....	....	2,000	....	....
Senegal	....	....	1,000	....	....
Asiatic Turkey	....	....	232,000	....	....
Total	18,349,000	83,000	64,190,000	17,963,000	2,000

EXPORTS OF PINE AND SPRUCE HEWN AND SAWN TIMBER BY COUNTRIES IN 1913.

Countries of destination.	Hewn small timber.	Railroad ties.	Other hewn timber.	Sawn small timber.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Russia	7,000	1,729,000	20,000	11,000
Sweden	22,000	....	....	....
Denmark	292,000	....	8,000	37,000
Germany	3,184,000	....	292,000	559,000
Netherlands	....	....	6,000	25,000
Belgium	13,000	....	....	....
United Kingdom	324,000	....	....	25,000
France	90,000	....	....	....
Spain	10,000	....	....	....
Italy	141,000	....	....	....
Egypt	4,308,000	....	1,000	....
Algeria	1,000	....	....	....
Total	8,392,000	1,729,000	327,000	657,000

EXPORTS OF PINE AND SPRUCE LUMBER BY SHIPPING DISTRICTS IN 1913.

Shipping districts.	Rough lumber.	Planed lumber.	Total.
	M feet.	*M feet.*	*M feet.*
Tornea and Kemi	114,076	....	114,076
Uleaborg-Brahestad	123,226	....	123,226
Gamla Karleby, Jakobstad, and Ny Karleby	44,882	268	45,150
Wasa and Christianstad	82,267	....	82,267
Bjorneborg and Raumo	208,822	3,579	212,401
Abo (including Aland Islands)	78,466	....	78,466
Hango and Ekenas	24,638	59	24,697
Helsingfors, Borga, and Lovisa	193,469	13,628	207,097
Kotka	272,229	976	273,205
Fredrikshamn	40,437	....	40,437
Viborg	293,964	200	294,164
Petrograd	49,585	....	49,585
Other districts	1,194	258	1,452
Total	1,527,255	18,968	1,546,223

AVERAGE VALUES PER 1,000 BOARD FEET OF FINNISH PINE AND SPRUCE LUMBER AS GIVEN IN OFFICIAL EXPORT STATISTICS.

Years.	Planks.	Battens.	Boards.	Planed lumber.
1894	$17.37	$13.70	$12.30	....
1895	17.37	13.70	12.30	....
1896	17.37	13.70	12.30	$14.11
1897	18.15	14.85	13.70	16.00
1898	19.11	16.80	16.00	....
1899	19.50	17.37	14.57	17.37
1900	21.81	19.11	16.00	18.15
1901	22.77	17.75	14.57	16.80
1902	22.77	18.15	16.00	18.15
1903	25.09	18.15	16.00	18.15
1904	20.46	16.00	14.57	16.00
1905	20.46	17.00	15.45	16.80
1906	20.46	18.15	17.37	18.15
1907	21.01	18.91	18.15	18.91
1908	19.11	16.00	15.45	22.77
1909	20.46	17.37	16.40	18.15
1910	22.77	20.46	18.15	22.77
1911	25.09	20.46	18.70	22.77
1912	25.09	18.15	17.37	23.75
1913	26.44	20.07	18.15	23.75
1914	26.05	20.46	18.15	24.13

VALUES PER CUBIC FOOT OF PINE AND SPRUCE PRODUCTS AS GIVEN IN FINNISH OFFICIAL EXPORT STATISTICS.

Products.	1912	1913	Products.	1912	1913
Masts, logs, etc	$0.085	$0.100	Hewn timber	$0.240	....
Telegraph poles	.133	.150	Hewn small timber	.120	$0.150
Props	.050	.050	Ties	.080	.085
Pulp wood	.050	.060	"Läkter," etc	.110	.120
Firewood	.019	.020	Sawn small timber	.160	.160

POSITION OF THE FINNISH LUMBER INDUSTRY, 1914 TO 1917.

[From statistics compiled by the Finnish Sawmill Owners' Association.]

Products.	1914	1915	1916	1917
Saw logs cut in forests ... number	21,163,960	14,716,207	10,340,588	10,351,968
Saw logs at end of year:				
In ponds ... do	12,496,361	12,804,858	13,093,693	11,408,655
In rivers ... do	2,828,241	3,736,399	2,861,155	6,557,169
Total ... do	15,324,602	16,541,257	15,954,848	17,965,824
Production:				
Pine lumber ... M feet	618,699	447,270	347,658	241,152
Spruce lumber ... do	223,586	126,536	114,705	61,843
Box shooks ... do	9,356	8,421	8,698	3,540
Staves and other small lumber ... do	85,922	50,633	32,155	27,183
Other kinds ... do	15,547	9,059	9,528	6,789
Total ... do	953,110	641,919	512,744	340,507
Sawn lumber on hand at end of year ... do	840,843	1,373,900	1,688,572	1,909,874

POSITION OF THE FINNISH LUMBER INDUSTRY, 1918–19.

[From figures compiled by the Finnish Sawmill Owners' Association.]

	Pine.	Spruce.	Staves, etc.	Total.
Estimated stocks of sawn lumber on Dec. 31, 1918, ... M feet	1,401,721	427,248	216,123	2,045,092
Estimated quantities sawn Jan. 1 to May 31, 1919 ... do	161,103	43,198	18,089	222,390
Estimated stocks on June 1, 1919 ... do	1,562,824	470,446	234,212	2,267,482
Sold for future shipment ... do	250,672	93,222	22,602	366,496
Saw logs on Dec. 31, 1918 (25,128,699 in ponds, 13,072,124 in rivers) ... number	....	....	....	38,200,823
Estimated cut of logs, winter 1918–19 ... do	6,885,846	2,853,576	....	9,739,422

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